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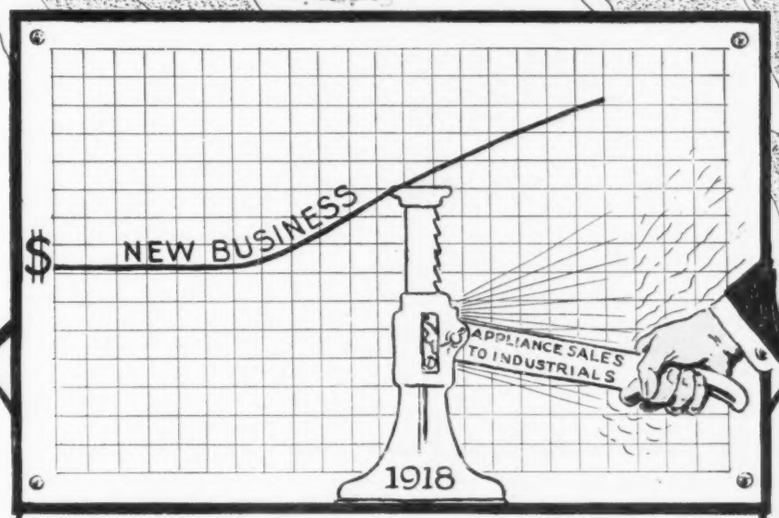

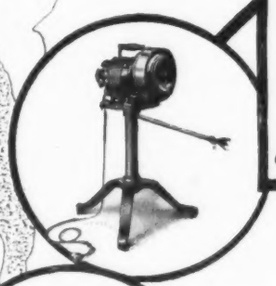

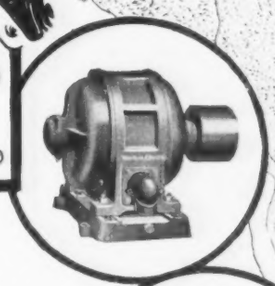

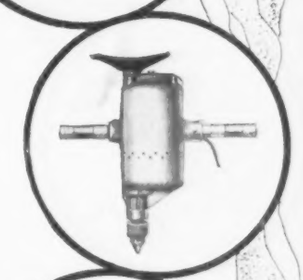

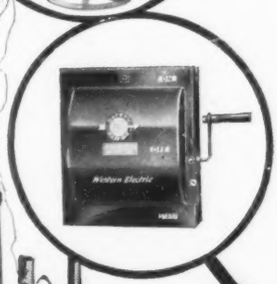

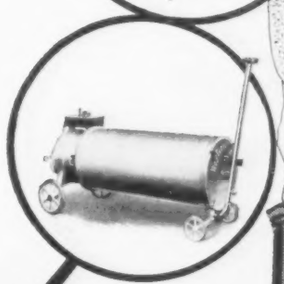

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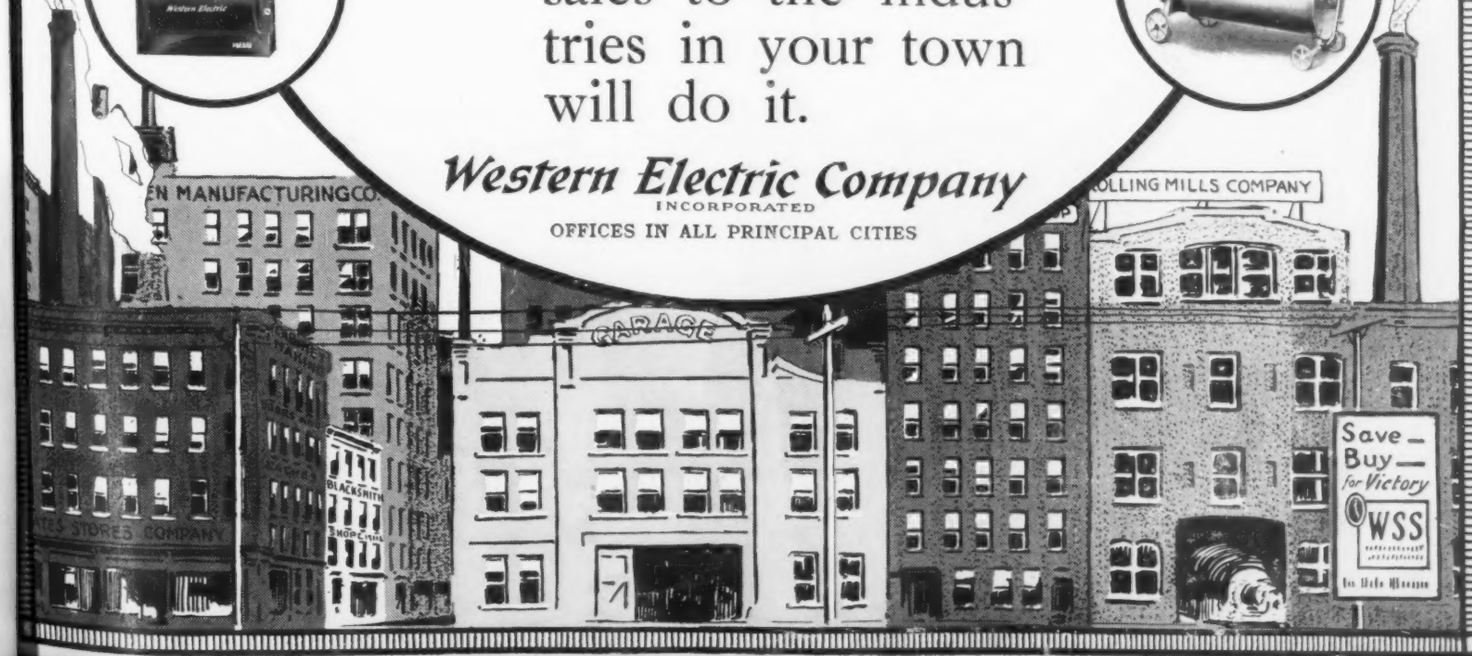

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Vol. 72, No. 8 New York, August 24, 1918 *Pages 337–384*

Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

Member Audit Bureau of Circulations, Member Associated Business Papers, Inc.

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

Volume 72 New York, Saturday, August 24, 1918 *Number* 8

War Service Must Come First

WAR conditions have required a change in policy of many public utility companies relative to new installation work. For the present, at least in some few localities, applications from the public for new service will be indefinitely tabled in the interest of meeting the increasing demands of the United States government for facilities. How great these demands have come to be is indicated in the bill introduced this week in the House of Representatives at Washington. In addition to a shortage in coal there is a growing shortage in materials which coincides with a pressing call from the government for more service. It needs no argument to establish the fact that the needs of the military forces and of the collateral government establishments must be met first.

About the last thing a public utility desires to do is to curtail its expansion of service, and there is no question that as soon as conditions permit the present near-embargo on extensions will be withdrawn. Meanwhile, every effort will be made to provide service for emergency cases and for others whose demonstrated needs are clear. Very little objection can be raised to this forced policy of central stations, and customers as a rule have accepted the conditions, feeling no doubt that in so doing they will in a very real way be doing their bit toward helping the government secure facilities absolutely essential to the prompt carrying forward of its offensive and defensive plans. Taken by and large, central-station companies have risen finely to their responsibilities in the direction of service quality and continuity since the United States entered the war, and we believe that the public will wait cheerfully, when it understands the facts, to enable the utilities of all classes to meet governmental obligations first, so far as these are apparent.

The Use of Protective Relays

IN ELECTRIC motor service for industrial purposes it is always a nice question to determine how far the equipment shall be made automatically foolproof. Much depends on the class of work being done and on the class of help to whom the operation is to be intrusted. The time ultimately comes when automatic protective apparatus reaches a degree of complication where it causes more trouble than it averts, and the general direction of equipment, as was indicated in a recent article in these columns, points to simplicity. There are cases, however, in which protective relays may be used with very great effect. A most ingenious device, for instance, is the so-called flutter relay, adapted to take care of motors themselves automatically varied in speed. Here a field relay to prevent too sudden variations of the field strength on reversal of the motor is very useful in checking excessive armature currents.

Perhaps the chief uses of such devices are in reversible motors such as are used for planer operation. In certain cases a reversing relay to soften the shock in case the motor regenerates current may be a desirable addition. In working induction motors important use is found for protective relays to serve as a safeguard in case of failure or reversal of a single phase or extreme drop in line voltage. Almost any contingency in starting or changing the speed of motors can be watched over by a properly designed relay, of which there are many on the market. But the extent to which these should be employed is one of the fine points of industrial motor equipment to which the engineer should give most careful attention. Especially ought he to bear in mind that the means should be suited to the end, and that while at some one particular point in the plant the most thorough safeguards are needed on account of the particular functions of a certain motor, elsewhere it may be desirable to reduce the motor-operating equipment to the lowest possible terms. The cases in which automatic appliances should be used, then, depend chiefly on the nature of the service and of the motors employed, rather than on any general principles of protection which should run through all classes of motor applications.

Getting Together for Business

MUCH of the future growth of electric station loads depends on increase in the use of various electrical appliances ranging from those which fit a lamp socket to a class requiring considerable energy and special wiring. The growth of this business has been fairly rapid, but is not yet proceeding at anything like the pace which it ought to take. One of the obstacles to its progress has been the fact that in many localities the central stations and the electrical dealers have not pulled together with anything like the efficiency which is possible. To bring electrical appliances of all sorts into extensive use requires the combined efforts of those who specialize in selling electrical energy and those whose business it is to sell electrical supplies of various sorts. The dealer has often thought that the central-station man who was trying to boom his appliance department was actually robbing him of

lucrative business, while, on the other hand, the central-station man has not infrequently had reason to believe that electrical dealers were very sluggish in appreciating the importance of appliance sales to themselves and have made no vigorous efforts to increase the business. Of course, there is actually no serious clash between the two. The sales of electrical energy and those things in which it is utilized inevitably must go, in one way or another, hand in hand.

Beginning with September, the Society for Electrical Development, Inc., will launch out on a "Save by Wire" campaign. This offers an excellent opportunity for manufacturer, central station, jobber and contractor to get together for the common good in a movement which, though it seeks to extend business, is nevertheless wholeheartedly patriotic. There are still wiring devices and electrical appliances available for use, besides the labor for installing them and the electrical energy necessary for their operation. Nothing connected with the campaign will in the least hamper the government or make undue inroads on an already scant coal supply. The object is to aid the general public in carrying or lightening household burdens and thereby release labor for other work. Phenomenal results are not to be expected from such a campaign at this time, for obvious reasons; but if the Society for Electrical Development only succeeds in getting the various branches of the electrical industry interested in the movement, it is enough. Coöperation is what we need first, last and all the time in the electrical business, and no effort in that direction should ever be slighted, nor is the time devoted to its attainment ever wasted.

Power Saving from Interconnection

WE HAVE so often preached the union of transmission plants into great networks that we should hesitate to inflict another sermon upon our readers save for the just cause given by a text from California, which has been the scene of so many brilliant exploits in electric power transmission. The paper by R. J. C. Wood in the current issue tells a story of economy of fuel and water which may well be taken to heart. It records the results secured by interconnection between two networks, that of the San Joaquin Light & Power Corporation and that of the Southern California Edison Company. The former has a heavy summer load due to pumping for irrigation; the latter has a normal lighting and power peak in November. Both depend for their main hydraulic supply on the mountain streams at high head, and both depend to a material extent on steam for reserve power, oil being the fuel used. The California streams are very variable in flow, and a large amount of power is lost in floods. Storage reservoirs connected with irrigation are to a certain extent used for hydraulic purposes, and some large independent reservoirs exist.

Combining irrigation and power is not always successful. It depends for success on the kind and amount of storage and the nature of the load demands of both power and irrigation. Where, however, it is possible to connect widely ramifying networks for the exchange of power it is not difficult to remedy these difficulties, since spare power anywhere can be utilized as demand arises, and with a joint territory big enough the diversity factor becomes immensely important. In the case before us the more northern system, freed in winter from its irrigation load, can help out the southern one, and in the summer a reverse exchange is practicable, so that less hydraulic power is lost and there is very much less call for the use of fuel oil by either system. The addition of power from the San Joaquin plant at critical periods of load will cut out entirely the use of power generated from fuel oil in the Santa Barbara territory and make great reductions in the use of fuel elsewhere on the combined system. By working out completely the transfer of power back and forth between these systems and connecting to the system all the hydraulic resources available, it is estimated that there will be a saving in fuel oil of more than 750,000 barrels during the current year.

This is no small showing for the results of skillful interconnection between two large adjacent networks, and it is to be noted also that the gains come directly from the varying use of power from time to time and place to place; in other words, from making the best possible use of the diversity factor. The watershed is substantially one from the hydraulic standpoint. That is to say, there is no considerable gain in the steadiness of production owing to different times of maximum flow. There are possibilities, however, in tapping different watersheds so as to give still greater conservation of the hydraulic resources than can be attained merely by working the loads to the best advantage. When both factors for gain can be combined so that hydraulic power production as well as the use of the power can be brought to a steady basis, there is still further chance for the saving of fuel and, what is equally important, the saving of the floods that now run uselessly to the sea. It takes careful planning and very skillful operation to make the most of the situation. The combination now under way, however, furnishes a striking example of the extent to which power can be economized by judicious joint operation of contiguous systems.

Factors That Govern Elevator Drive

THE electric elevator has been coming into its own within the last decade at a very surprising rate. One does not hear much about it in the sensational press, but one sees with increasing frequency signs on buildings under construction proclaiming the origin of the electric elevator system. As the demands of elevator service have increased both in speed and in lifting power, it was only natural to fall back on the general source of distributed energy for means of operation. The electric elevator is economical in operation, easy to keep up, simple and compact, and safety devices may be applied to it with the extreme facility which characterize most electrical modes of driving.

Professor Clewell's notes on this subject in the current issue neatly summarize the general methods employed. The principles of the design of the lifting gear are pretty much the same for all sorts of motive power. For most practical cases the winding drum or

the traction sheave in some form or other is used, the latter more generally. So far as the motors themselves are concerned, the requirements are somewhat special, chiefly in the direction of high starting torque, and in direct-current machines sparkless operation even under extreme variation of load and overload. It is also rather necessary that the operation should be quiet, unless of course in freight service in buildings otherwise far from noiseless. The result has been the development of a somewhat highly specialized class of motors, generally now-a-days with commutating poles, designed for high overload capacity and with large mechanical factors of safety.

Non-Technical Power-Plant Descriptions

A RECENT example of first-class publicity which came to hand in connection with the building of a 100,000-kw. power plant contains a number of very suggestive points relative to the interest such an installation has from the popular standpoint. A newspaper "story" about a power station just completed can be made most helpful to the operating company's interest, or it can be couched in such dull terms as to be worth very little as a factor in developing community good will. Not every manager has the knack of writing a readable newspaper article about his new plant, and, on the other hand, very few reporters can be trusted to lead their readers of the daily press through an installation from coal pile to feeder pot-heads without getting into serious trouble technically. There is a real field, however, for non-technical articles written from the popular viewpoint, and in cases where the utility manager has an opportunity to check the "copy" from the standpoint of accuracy only, letting the "story" run on its own merits for the most part, the best results can be obtained.

To the engineer the colloquial treatment of his station in a newspaper article may appear at times amusing and provincial, but it is just by these appeals that the layman gets an idea of the progressiveness of the company. Homely, straightforward expressions, put in terms that an ordinarily intelligent person can appreciate, are what are needed. It is of no concern to an outside engineer that a particular stack is the highest in its neighborhood, but such an item is of more popular interest than questions of weight per square foot of foundations, pressure of draft and horizontal cross-section of stack construction. And constructive interest in a company's work is worth securing, even at the trouble of procuring popular articles upon its service and equipment.

Getting Economy in the Fire Room

A PAPER by Edwin A. Hunger, in this number of the ELECTRICAL WORLD, on the training of the fire-room force, deserves close consideration. We are confronted by two allied and unpleasant contingencies—first, the certainty of being somewhat short of fuel; second, the extreme difficulty of getting mechanical equipment for the boiler room in face of the restrictions due to government requirements. The time has not quite been reached when one must have a priority order to purchase a coal shovel, but things are squinting that way. Add to this the ever-increasing scarcity of labor, and the situation is evidently one which is somewhat menacing. Mr. Hunger's advice is extremely good—to pay the greatest possible attention to the efficient training of the fire-room force, so that in the very large number of cases where hand firing is necessary it can be carried out to the best possible effect.

There is no doubt that skillful hand firing can give results comparable to the best obtainable with mechanical stokers, but careless or unskillful firing falls far below this standard. The difference may easily amount to a quarter or even a half of the coal input necessary to secure the results. In one of the large plants to which Mr. Hunger refers the coal cost per kilowatt-hour was reduced during the last year by one-third. Part of this gain was due to improved turbine economy and improvement in mechanical stokers, but a considerable portion must be directly charged to better methods in dealing with the boiler-room force. For skill counts even where the actual rough work of firing is mechanical. Constant and careful training and supervision, with full recognition of the importance of the skilled fireman to successful operation, seem to be the keys to success in economizing fuel. No set program of training and encouragement can well be laid out since local conditions vary so widely. The bonus system has been tried with rather indifferent results, as has also the encouragement of competition between firing gangs. Above all, close supervision to detect and remedy bad practice and to encourage efficiency seems to be the best remedy. That it pays even when it involves material increase in the labor cost seems beyond question. It is particularly important just now because electric supply companies have to use, not the fuel which they used to like best, but that which they are lucky enough to get, and the fire-room methods in the two cases are likely to be very different. Rigorous attention to the condition of the boilers too may be counted on for large results. Persistent watchfulness to insure clean flues and freedom from scale and from leaks in the boiler settings will pay its cost many times over.

The Coming Issues

RATES are probably being altered less under war conditions than the changes in the cost of generating energy really justify. This situation gives special timeliness to an economic study of basic factors in rate making which is to be published in early issues. "If the term 'charging what the traffic will bear' is properly understood and is scientifically applied," says the writer, "there simply cannot be anything unreasonable in the rates themselves." Rate making will need most careful consideration in the changes of the war and post-war period, and these articles will be of much interest to officials of central-station companies who are responsible for the policies followed in that respect. Another article on the industrial application of electrical energy, by Professor Clewell, is to appear. A summary of various arrangements that have been proposed in the last fifteen years for high-power-factor, variable-speed induction motors, with particular reference to developments in France, will be printed.

Factors Governing Elevator Drive

Standard Safety Features Usually Embodied in Control Equipment—Power Requirements of Elevators and Types of Motors Suited to the Service—Direct-Current and Alternating-Current Elevator Motors

BY C. E. CLEWELL
Assistant Professor of Electrical Engineering, University of Pennsylvania

THE subject of electric elevator operation may conveniently be divided into a study of (a) the elevator machinery itself, (b) the driving motor, and (c) the control equipment, although, properly speaking, the coördination of these three elements of the problem is of fundamental importance to success in such applications of the motor.

The preëminent position now held by the electrical operation of elevators is due in no small measure to

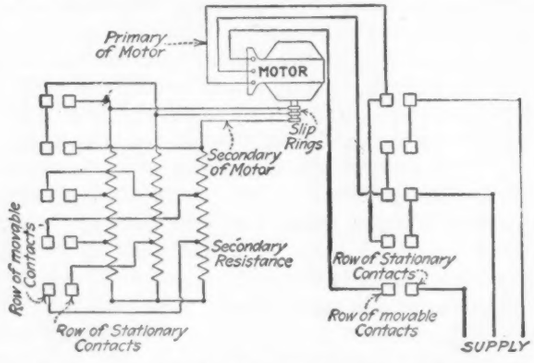


FIG. 1—CONNECTIONS FOR A THREE-PHASE SEMI-AUTOMATIC ELEVATOR CONTROLLER

the following well-defined features which characterize the modern motor-driven elevator equipment—first, the convenience with which safety devices may be employed; second, the simplicity and compactness of this form of apparatus, coupled with the economy in operation and upkeep and the ease with which control may be accomplished. The fact that these features have received widespread acceptance, in spite of the highly developed state of older methods of operation, is indicated by the almost universal adoption of motor drive under the widely different conditions of high-speed passenger service, moderate speed freight and passenger equipment, and low-speed freight elevators with their more or less intermittent operation.

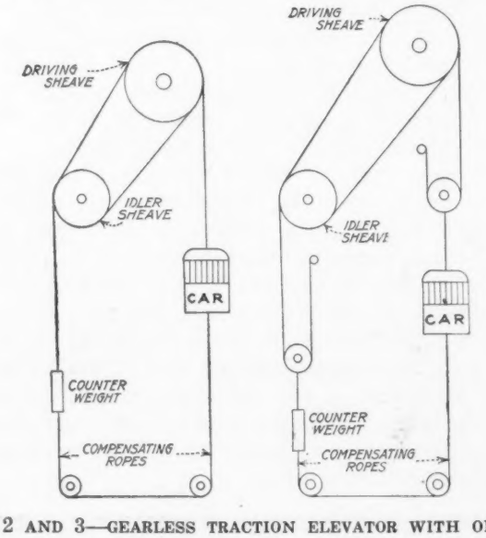
METHODS OF OPERATION

Electric elevators may be classified under two broad divisions of operation. First come those provided with so-called winding drums, which are grooved spirally and in the operation of which the cables simply wind and unwind as the car is raised and lowered. This type is employed for relatively low buildings where the lift is, say, less than 100 ft. (30.5 m.) and is adapted to speeds up to about 200 ft. (61 m.) per minute. The second class makes use of so-called sheaves which have straight grooves for holding the cables. Here the cable operates in the raising and lowering of the elevator by the friction between the cables and the sheaves, thus giving rise to the term "traction-sheave" type. This class of elevator has practically no limit to the height of the lift and may be used for speeds from about 200 ft. to, say, 700 ft. (61 m. to 213 m.) per minute.

The well-known methods of roping and counterbalancing commonly employed for the winding-drum elevators need hardly be commented on at this point other than to state that experience indicates the advantage of employing two ropes between the drum, the elevator and the counterbalance, instead of one, for the purpose of reducing the size of the rope necessary and also for the gain in the use of drums and sheaves of smaller diameter than would be possible otherwise. Counterbalancing is usually so proportioned as to meet the average conditions of load. Furthermore, for the larger distances of car travel the variations in the cable positions for different parts of the run may be compensated for by the use of a supported chain attached to the under side of the car and to the central point of the hatchway. Formulas have been worked out for the determination of the necessary weight of such a compensating chain per foot of length, the importance of which is apparent when it is considered that this feature is adopted primarily as a means for smoothing out the otherwise variable nature of the motor load.[1]

THE TRACTION-SHEAVE ELEVATOR

Simplicity of equipment for high-speed elevator service is accomplished by the use of traction sheaves, the



FIGS. 2 AND 3—GEARLESS TRACTION ELEVATOR WITH ONE-TO-ONE ROPING USED FOR CAR SPEEDS OF 500 FT. PER MINUTE AND ABOVE AND TWO-TO-ONE ROPING FOR CAR SPEEDS UP TO 450 FT. PER MINUTE

scheme of which is illustrated in Figs. 2 and 3. The advantage of this method of driving is most apparent, of course, for the higher lifts, where the dimensions of a

[1]See "Standard Handbook for Electrical Engineers," section on "Elevators," p. 1219. Diagrams of the roping arrangement for elevators of the winding-drum type are given in this handbook section.

winding drum would become unduly large. In a general way the gearless traction elevator is available in two forms, commonly known as the one-to-one roping arrangement (Fig. 2) and as the two-to-one scheme (Fig. 3), the former being used for the operation of car speeds of 500 ft. (152 m.) per minute and more, and the latter for speeds below 450 ft. (137 m.) per minute.

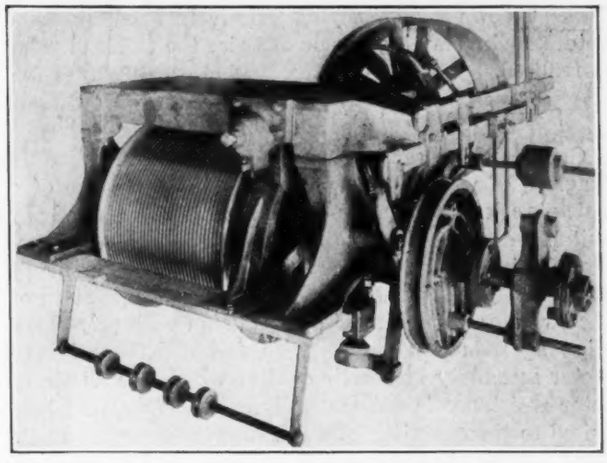


FIG. 4—HANGING TYPE OF BELT-DRIVEN ELEVATOR MACHINE FOR 1000 LB. TO 6000 LB.

The equipment for the one-to-one machine is made up of a low-speed motor and a mechanically attached driving sheave and brake wheel. The driving sheave is made as small as the wear on the ropes will allow, for the purpose of making possible a high motor speed. The traction sheave for the two-to-one equipment may be smaller than in the one-to-one machine, because of the smaller size of rope usually employed in the former, $\frac{3}{8}$ in. (15.9 mm.) being standard for the one-to-one machines and $\frac{1}{2}$ in. (1.27 m.) for the two-to-one apparatus.

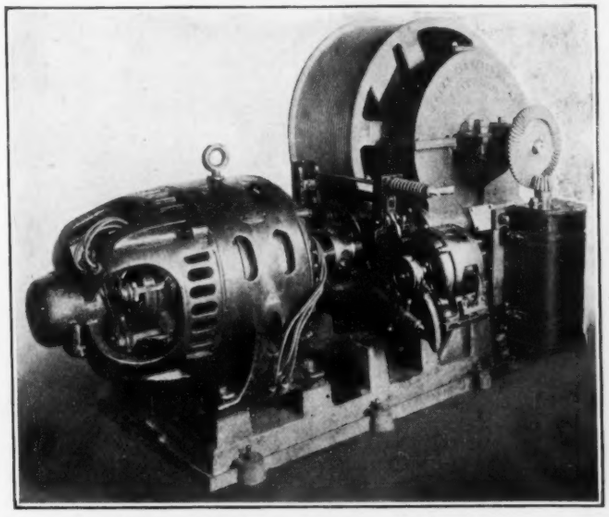


FIG. 5—DIRECT-CONNECTED ELECTRIC ELEVATOR AVAILABLE FOR BOTH DIRECT-CURRENT AND ALTERNATING-CURRENT OPERATION; CAPACITY, 2000 LB. TO 10,000 LB.

An inspection of Fig. 3 will show that the elevator speed with this roping arrangement is half that of the rope speed. The equipment of the two-to-one machine is similar to that of the one-to-one outfit, and it may be stated that the limitations to the use of the two-to-one roping scheme, even with its lower cost, are due to the excessive wear of the rope, because of the high rope speeds where the car itself operates at high lift speeds. The rope speeds, being limited to about 900 ft. (274 m.) per minute, make the car speed limit about 450 ft. (137 m.) per minute for the two-to-one arrangement.[2]

Two requirements of direct-current motors for elevator operation deserve special mention, namely, high starting torque and freedom from sparking difficulties under extreme load variations and high overloads. To these items quietness of operation may be added, this feature being important in such cases as apartment buildings, hospitals, office structures and the like.

As typical of the developments of this line of motors any one of a number of types might be mentioned. With one company's equipment ranging from 5 hp. to 50 hp. for standard voltages of 115, 230 and 550, commutating poles are employed, emphasis being placed upon such features as rolled-steel frames with forged steel feet, adequate radiation, large shafts and leak-

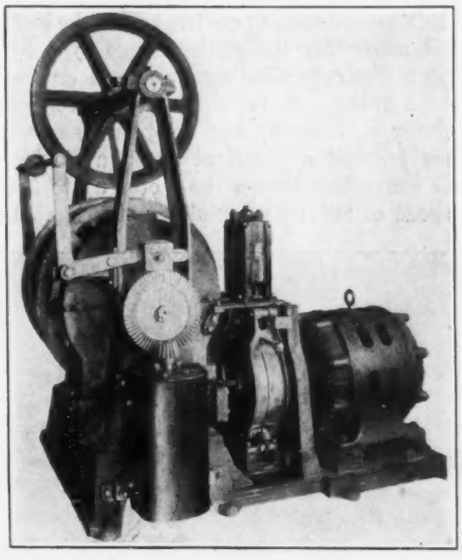


FIG. 6—DIRECT-CONNECTED MOTOR-DRIVEN ELEVATOR WITH CONTROLLER IN THE FOREGROUND

proof bearings, high efficiency, low operating temperatures and a high overload capacity.[3] These motors are available in three classes, which are mentioned here to indicate the marked coördination of the motor design with the variety of service usually encountered.

Motors of the first class apply to high-speed service (passenger) and have a speed range of two to one with field control. The fields are shunt-wound to provide uniform acceleration and are furnished with a damping winding of the short-circuited type. In class 2 the motors are of the single-speed form and apply primarily to installations where medium speeds are used. Motors for low-speed freight service constitute the third class. In both of the latter classes a compound winding is used with a short-circuiting arrangement for cutting out the series field as soon as the car is under headway. This means simply that the motor operates normally as a shunt machine except during the starting periods.

[2]See paper by A. Brunt, *Transactions* A. I. E. E., Vol. 34, Part I, p. 196.

[3]Westinghouse practice.

ALTERNATING-CURRENT MOTORS

As usual in motor applications of this general nature, the available motors for alternating-current operation are of special interest from the central-station standpoint. Among typical standard types there may be mentioned the straight squirrel-cage motor, the two-speed alternating current motor and the induction motor of the slip-ring type.

Standard squirrel-cage elevator motors are made for two-phase and three-phase supply circuits, for 25 cycles and 60 cycles, and are operative at standard voltages of 220, 440 and 550. They are used for both passenger and freight service where the speeds are low, that is, 150 ft. (46 m.) per minute and less, and require an extremely simple form of controller, consisting merely of a reversing switch without auxiliary resistance. In connecting this motor directly across the line twice the full-load torque is obtained with two and a half times full-load current, and smooth acceleration is thus realized.

The two-speed alternating-current motor is adaptable to the operation of elevators with car speeds up to 350 ft. (107 m.) per minute, in contrast with the lower value mentioned above for the squirrel-cage type of equipment. Two separate windings are used on the stator and on the rotor. A twenty-four-pole connection is employed for starting by one company, and when the motor has reached a sufficient speed a change to an eight-pole connection brings the motor up to 850 r.p.m. from a speed of 250 r.p.m. used for starting. In slowing down the reverse sequence is used, the change from eight to twenty-four poles while the motor is running at the higher speeds making it possible to utilize the generator action of such a motor while operating above synchronous speed. This braking action brings the motor quickly down to the speed corresponding to a twenty-four-pole connection, and the final braking is then accomplished by an electrically manipulated mechanical brake in the ordinary manner.

According to current practice with slip-ring induction motors for elevator service, a common range in the sizes of one principal type is from 2 hp. to 50 hp. for 25-cycle and 60-cycle circuits, two-phase and three-phase, and for the standard voltages listed above for the other alternating-current forms. Flywheel effect is kept down by employing relatively small-diameter rotors, and a starting torque of twice the full-load value is realized.

SEMI-AUTOMATIC AND SEMI-MAGNETIC CONTROL

One standard semi-automatic elevator controller (a diagram of which is shown in Fig. 1) makes use of a quick-break butt-type form of contact protected by suitable arc shields. This form of controller is employed with a hand rope or a lever in the elevator itself and is designed for positive mechanical manipulation of the switches. It is used in conjunction with poly-phase slip-ring induction motors with full resistance in the motor secondary at starting, after which the auxiliary rotor resistance is automatically cut out at a rate best suited to the operation of any given equipment, adjustment for the accelerating rate being possible at the controller itself. When stopping the elevator the sequence is reversed in the sense that all secondary resistance is cut in before the disconnection of the motor from the line.

The operating features of this semi-automatic control equipment are interesting in that they illustrate one special form of control in contrast to the full-magnet apparatus described below. The hand rope in the elevator car operates a sprocket, which is mechanically fastened to the primary cam shaft. This action of the cam shaft closes one set of the primary switches (Fig. 1) and starts the motor, and the same action releases

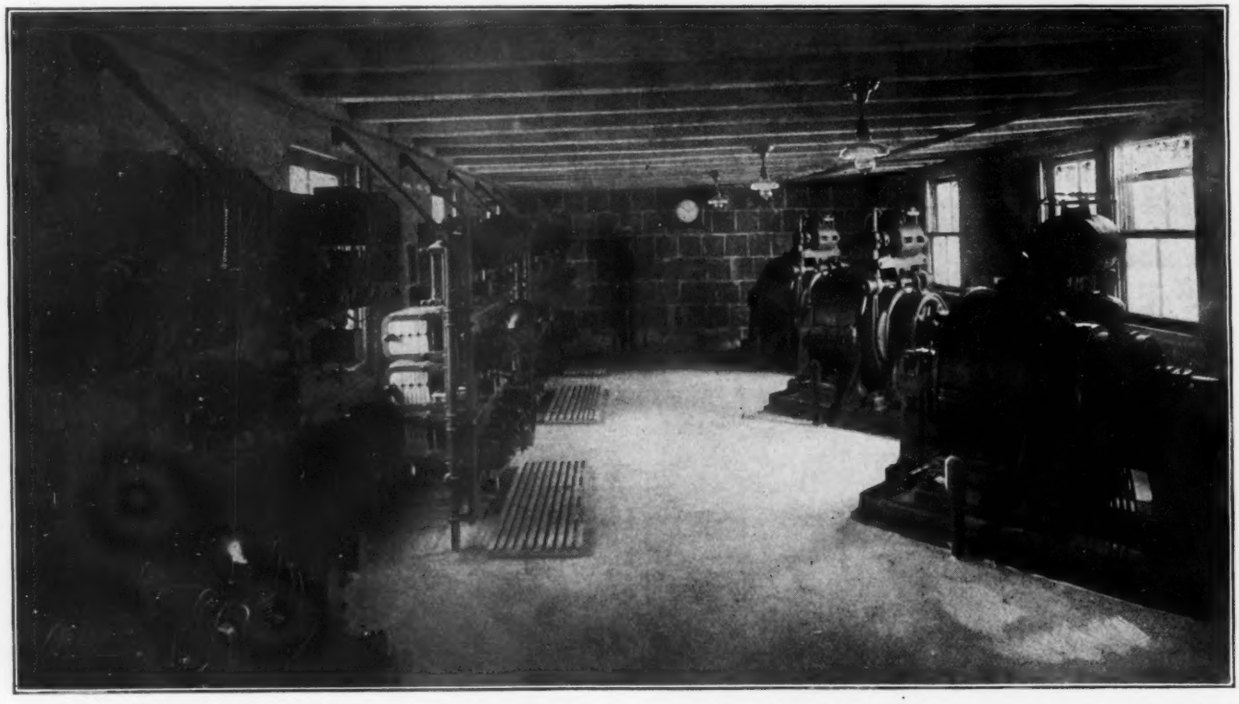


FIG. 7—DIRECT-CURRENT MOTORS AND AUTOMATIC CONTROL FOR ELEVATOR SERVICE (NOTE ARCING AT CONTACTOR SWITCHES)

a weight arm which is attached to the secondary cam shaft, closing the secondary switches in such order as to accelerate the motor properly. The motion of this weight arm is retarded by an air dash-pot. Motion of the controller to its off position opens the secondary switches, thus cutting in the auxiliary resistance, and the primary switches are then opened.

Semi-magnetic controllers, as the term implies, employ magnet switches in conjunction with a reverse switch (of the drum type) which is hand-operated from the elevator car, in one of the standard forms, by a

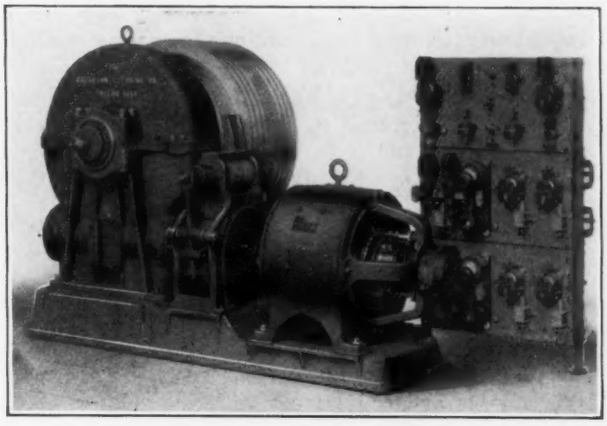


FIG. 8—DIRECT-CURRENT MOTOR AND AUTOMATIC-CONTROL PANEL FOR HIGH-SPEED ELEVATOR SERVICE

hand rope or hand wheel for starting, stopping and reversing.

The many advantages of the completely automatic controller of the magnet type include such features as safety and prevention of improper starting, and it is used in most cases. In this form of control a switch in the elevator car merely serves to give the operator control over the elevator, but the actual operation of the magnetic contactors is not directly dependent on this master switch. In this way the rate at which the actual connections are made depends on the contactor switches themselves and not on the way in which the master switch is manipulated. Obviously such a scheme provides the elements of protection for the apparatus itself, and the accompanying safety devices, which are readily used as a part of the electrical equipment, form an added feature of importance.

SAFETY DEVICES

The use of a magnetic main switch and a magnetic brake makes it possible to employ numerous safety devices, by which the magnetic main switch is opened automatically, thus disconnecting the motor from the line and applying the brakes. This action is also caused in standard equipment by any trouble arising in the motor, the controller or the elevator apparatus itself.

The purposes for which safety devices are designed are perhaps best shown by the following list of items: The safeguarding against overtravel (hatchway limit switch); to prevent operation with any door open (door safety switch); protection in case the car or its counterweight should be jammed (slack cable switch); to offset the release of the handle by the operator (automatic return of car switch to off position); to prevent the start of the car by any one leaning against the handle (center-holding latch on main switch); failure of the regular car control features to stop the car (car safety switch); the machine limit switch for stopping the car at the top and bottom landings if the car switch becomes inoperative for stopping purposes, and relays for protecting the motor and preventing the operation of the car in case a failure or reversal of phase should take place.

The foregoing list of safety appliances needs no further comment than perhaps to point to the flexible manner in which the electric outfit lends itself to such devices and the corresponding advantages thus secured in safeguarding both the electric equipment and those served by the elevator.

Automatic push-button control makes possible the control of an elevator by means of push-button stations in the car and at the landings and thus eliminates the requirement of a special operator. Where a relatively small demand for elevator service exists, as in small family hotels, apartment buildings and the like, this particular type of control makes a special appeal. To illustrate the equipment required for such an arrangement the following list of apparatus is given as applicable to a typical two-landing push-button passenger elevator control outfit: one controller, four hatchway limit switches, one slack cable switch, one door switch for each landing, one two-landing gang push-button switch, one emergency stop button, two single push-button switches and one brake magnet.[1] With such a scheme a passenger on entering the car must first close the door before operation by the start button is possible. The button corresponding to the desired floor is then pressed, and the car automatically stops when the given floor is reached.

POWER CONSUMPTION DATA

Available figures show wide variations in the energy consumption per mile of elevator travel, depending on such factors as the average load carried and the number of stops per car mile. Obviously, therefore, the power consumption will vary in buildings of different types. For a given load and speed available figures show in one specific case a range from 1.48 kw.-hr. to 7.34 kw.-hr. per car-mile (2.37 kw.-hr. to 11.75 kw.-hr. per car.-m.) where the number of stops between the terminal landings per mile of travel ranged from zero to 380. In another case the kilowatt-hours consumed per car-mile practically doubled with approximately a 100 per cent increase in the stops per car-mile. These figures, while merely illustrative, are of considerable interest at this time owing to recent rulings affecting elevator service for the conservation of fuel.

BIBLIOGRAPHY. — Paper on "Characteristics of Direct-Current Motors for Elevator Service," by A. Brunt, *Transactions* A. I. E. E., Vol. 34, Part I, p. 196; section on "Elevators," "Standard Handbook for Electrical Engineers," by D. L. Lindquist, p. 1217; data on "Elevators," National Electric Light Association; bulletins, data and illustrations from the following concerns: Westinghouse Electric & Manufacturing Company, Salem (Mass.) Elevator Works and the Cutler-Hammer Manufacturing Company. Figs. 2 and 3 are based on diagrams found on page 207 of Mr. Brunt's paper referred to above.

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[1] Based on the practice of the Cutler-Hammer Manufacturing Company.

Education of Boiler-Room Men Necessary

Human Element Important Factor in Fuel Conservation Efforts—Means of Fostering Interest of Firemen—Notes on the Experience of Several Companies

BY EDWIN A. HUNGER
For United States Fuel Administration

AFTER all that has been proposed and done recently to increase fuel economy is properly considered, it is difficult to get away from the fact that, particularly in these war times, when means for producing mechanical coal-saving devices are not of the best, the human element looms up as the most important factor in conservation efforts. Without intelligent operation and management the best of boiler equipment cannot prevent the waste of fuel. Furthermore, it is easier now to reorganize operating methods to conserve coal than it is to obtain new equipment to do the same thing. Therefore, one of the surest methods of obtaining high fuel economy is to educate the entire boiler-room personnel in correct firing methods.

A study of fuel economy by means of the human element is of particular interest to the central-station man at this time since increased labor turnover and general scarcity of labor have added difficulties in organizing efficient boiler-room forces and in creating a spirit of economy among the men without which real fuel conservation is impossible. In many cases the shortage of labor supply has forced managers to direct attention for the first time to the education of their firemen and proper boiler-room accounting methods. In many plants this should be a blessing in disguise, for without careful supervision of the man handling the coal pile large leaks are sure to occur.

LESSONS FROM LAST WINTER'S EXPERIENCE

Last winter a serious coal shortage existed and drastic methods were necessary to provide fuel for essential war operations. The danger of another shortage next winter is very great, and unless every plant in the country resorts to every possible economy and uses fuel when only absolutely necessary further curtailment may be required this year. If such is the case, so-called non-war and non-essential industries may have to go by the board until after the war. Of course, such action will come only as a last resort, and to forestall it as long as possible it is the patriotic duty of every consumer to save fuel. The central-station people can help much in this big project of coal conservation by getting acquainted with the men in the boiler room and exchanging ideas on saving coal.

The present is a particularly opportune time for introducing fuel-economy propaganda to the fireman. He knows full well that this is every man's war and that his efforts and those of all his neighbors and co-workers are needed to bring it to a satisfactory end. An appeal to be careful in the use of coal because "Uncle Sam needs that extra shovelful" will be painstakingly heeded. For similar reasons he is now more apt to take heed of operating directions which in other times he might pass over with disdain. He is a willing subject and can easily be made to have the desire to save coal. It is up to the management, therefore, to teach him how.

The time has also come for the introduction of Mr. Manager to Mr. Fireman. It is high time that plant managers should know more about the personnel in the firerooms. The fireman is a human being and likes to feel that he too is an important cog in the big machine. If he is made to think so by the big boss, the other bosses will quickly fall in line and treat him with proper respect. Much depends on the attitude of the "higher-ups," therefore, and if they give the right kind of encouragement and sympathy to the firemen and urge them to think fuel economy and practice it to the best of their knowledge, the possibilities of reducing the amount of coal used will be very good.

MEANS OF ENCOURAGING FUEL ECONOMY

Various devices may be utilized for fostering the interest of the fireman in fuel conservation. Lectures, night classes and conferences with the chief engineer will help immensely. Placards with fuel-economy precepts printed in large letters posted in open places where they can be plainly seen by every one in the boiler room will also keep the big idea of conservation continually in the workman's mind. To prevent a lapse of interest in these placards they should be changed frequently and, if possible, printed in different colors. Such frequent change will automatically tend to revive the man's interest, and the fact that effort is made to change them will show him that interest in fuel economy in the front office is also not on the wane.

This sustenance of interest in fuel economy is important. Like all good industrial movements, it requires continual application. The idea of fuel economy must frequently be dished up to the fireman in new dresses lest his interest wane. An occasional visit by the manager or superintendent will help. Frequent talks and conferences with superiors should be introduced. Recognition for efforts in effecting savings will also encourage the fireman to keep up his interest in the saving of fuel. The plant bulletin or newspaper is another means for keeping interest in fuel economy at a keen point. In fact, every possible effort for making the fireman think everlastingly in terms of fuel economy should be introduced in order that the plant may operate with a minimum consumption of coal.

The United States Fuel Administration has been gathering data on the practice of fuel conservation in some of the power plants. Some of the information obtained on handling the boiler-room force is given herewith.

E. M. Gilbert, chief engineer of the W. S. Barstow Management Association, writes as follows on this subject: "A year ago our coal cost per kilowatt-hour in the West Reading power house of the Metropolitan Edison Company was 3.2 to 3.3 mills. Our coal costs at the present time are running from 2.1 to 2.2 mills. Part of this economy has been due to an added turbine,

giving increased economy, and part to a change of mechanical stokers; but fully 25 per cent of it has been due to better methods of handling the boiler room.

"We had contemplated the trial of a bonus system, but some experiments carried on at various places led us to abandon this idea. In the first place we found that a great many of the firemen were intelligent enough to take advantage of any bonus system which could be applied on the basis of CO_2 measurements. In the plant where this was tried firemen soon ascertained that the man who did not force his boiler too hard but kept a thick fire with the damper partly shut and not too great an air pressure often obtained a better percentage of CO_2 than the fireman who pushed his fire as hard as possible. While this was in very many cases not entirely true, still the idea became fixed in the firemen's minds that this was the way to earn a bonus, and we immediately had trouble in getting the best results from our boilers and because of the contentions between the men that some were carrying all the load and doing all the work while some were doing little if any.

"In other plants we installed steam-flow meters and tried to work the two plans in conjunction, but we feared that the bonus system, from the little we had experimented with it, would cause trouble among the firemen and would disrupt our labor organization, which was difficult enough to maintain under present labor conditions, and we finally, therefore, adopted the following method:

"We installed two young power-house engineers, boys from college getting from $60 to $90 per month, who were anxious to progress and interested in our work. CO_2 recording apparatus, which could be transferred from one boiler to the other, was installed, and as our boilers are all equipped with steam-flow meters, feedwater heaters and Richardson coal scales, we were able to keep daily records for each shift in this way. The actual record of what was done by each one of the three shifts is carefully kept and is published each six weeks, showing just which shift is obtaining the best results regarding the actual coal used per kilowatt output.

STIMULATING RIVALRY BETWEEN SHIFTS

"The six-week period is adopted because the men change shifts every two weeks, and this length of time gives each shift of firemen two weeks' service on the day shift, two weeks' service on the night shift and two weeks' service on the graveyard shift. This plan stimulated the rivalry between the shifts to a great extent, and though no bonus or money offer was made to the firemen, a spirit of competition has developed between the shifts, especially between the foremen of each shift, as to who can obtain the best results. The young engineers whom we have employed not only take an analysis of the coal occasionally but analyze the ashes taken out by each one of the shifts each day to determine the amount of carbon contained in these ashes. A sample is taken by the ash men when they are cleaning out the ash pits, and the analysis is made every morning, being published for the benefit of the various shifts. By this method we have reduced the percentage of carbon found in the ashes by more than 50 per cent.

"At the present time a great deal of difficulty in obtaining coal is being encountered, and fuel of any class or description is being used, so that we are not able to make so much progress with our conservation of fuel as we had hoped, the variation in the fuel value being such that the comparison between the shifts is now often useless.

"We think the method described above is one of the best which can be used, and we still hope that we can work out a satisfactory bonus system for each shift as soon as conditions improve regarding coal supply.

"Our men show intelligence, and a great many of them show eagerness to obtain information regarding the methods of operation. We find that the employment of a high class boiler-room engineer, who knows enough about the apparatus and firing to have the entire respect of the boiler-room force, is essential and has a great deal to do with the proper application of any method which may be put into use."

PRESENT BOILER-ROOM LABOR NEEDS MORE SUPERVISION

Another interesting communication on the same subject, from E. J. Billings, mechanical engineer for Henry L. Doherty & Company, is given below:

"Just at the present time, and for several months past, we have found it necessary to devote a large part of our energies to a study of our plant organizations in an effort to keep them up to their standard of a year ago. We find that under the present labor conditions it is necessary to provide considerably more plant supervision than heretofore. This is due, of course, to the shifting and uneasiness of both skilled and unskilled labor. For example, in one of our larger plants it has been necessary to provide an assistant chief engineer to assist the chief engineer in looking after the operating details where the chief engineer was formerly able to do this alone. In several of our smaller plants which have been operating quite economically in the past without boiler-room foremen it has recently been necessary to provide such foremen, and, further, it has been desirable that these foremen be very wide-awake individuals. We have found it necessary in another plant to provide a repair foreman or master mechanic to take general supervision of maintenance work. We find that this necessity for added supervision prevails all down through the line in our power-plant organizations.

"We find it necessary also to put more emphasis than ever before on the first principles of boiler-plant operation, including such things as keeping the heating surfaces of the boilers free from scale and soot, keeping the settings, baffles, arches, grates and boiler accessories in good repair, making use of the boiler dampers, breaking up lumps for hand firing, proper methods of cleaning fires, proper methods of firing, etc. We find that where these things were formerly taken care of almost automatically we now have to keep continually fighting a callousness to them among our operating men.

"I do not believe that these conditions are peculiar to our own plants only, but that it is much the same in every boiler plant, and I also believe that these conditions are being met in a great many plants in only a half-hearted and ineffectual manner, resulting in very great wastes of fuel. If every manager or superintendent who is directly responsible for the operation of a boiler plant could have an exact diagnosis of the operating condition and its significance laid before him, he would at once take the necessary steps to relieve the

undesirable conditions in so far as it lies in his power to do so. The demand for a few unusually keen operating men in the more important positions of every plant has never been felt by us so greatly as at the present time, and we believe that we will be fully compensated if we devote our efforts to finding and developing men of this class.

"Some other things along the line of fuel saving which we are doing may be mentioned very briefly. We have our plant inspectors who visit our plants at intervals and report in detail on the physical condition of the plant equipment. We also have results engineers who study and analyze the operating results, make plant tests, etc. We have a chemical laboratory for analyzing coal, ashes, oils, water and other power-plant material. We have recently been sending out a series of fuel-saving bulletins to be posted in our plants, one at a time, calling attention to some of the elementary principles of boiler-plant operation.

"We are equipping our plants as rapidly as possible with steam-flow meters on each boiler and meters for measuring the feed water. We are also giving a good deal of attention to keeping our boiler settings air-tight by the use of boiler coatings or cements which are now to be found on the market. We are also equipping our boilers as rapidly as possible with mechanical soot blowers to take the place of the old method of using a hand steam lance.

"We have tried various plant bonus schemes with more or less success, and while we are heartily in favor of the plan, we have been unable as yet to apply it generally throughout our plants, or with continued success in any one plant, owing to changes in plant conditions, to shifting labor conditions or to defects of the plan."

DEALING WITH THE PERSONAL ELEMENT

The following from Samuel Insull, president of the Commonwealth Edison Company, tells how the personal element is handled in the stations of the great Chicago electric company to bring about fuel economies:

"Technical, experienced men, who are in charge of the boiler-room tests which are frequently conducted, instruct and educate the boiler-room operating men in the more important positions in the importance of proper methods of firing and operating the boiler-room equipment and the effect that the proper methods have upon the actual resulting efficiency in the production of steam.

"The two things that they are taught to avoid are the running of too thin a fire and thus admitting an excess amount of air and, on the other hand, runnig too thick a fire and thus losing too much coal over the end of the grate with the ashes. Of course, with the chain-grate stokers generally used in this part of the country, in order not to have too thin a fire as the grate travels toward the back end of the furnace, a certain amount of coal, perhaps 1 or 2 per cent, with good firing, is allowed to go over the grate with the ashes; but the point is to run the fire so that not more than the necessary amount of coal is allowed to go to waste with the ashes. For best results, the fire must run as strong or as hot as possible, and the firemen are required to cut off boilers as the load decreases, rather than continue to operate all the boilers with less intense fires.

"In smaller plants, in cases where the grate area is a little larger than is necessary for the demand for steam, rather than reduce the intensity of the fire, it is our practice to reduce the grate area."

Cleanliness about the boiler room is an important factor in the maintenance of economical use of fuel. The boiler, for example, never can be too clean, both inside and outside. Soot is a poorer conductor of heat than asbestos. It pays, therefore, to clean the flues frequently. Similarly, if the interior of the boiler is coated with scale, much more coal is required. These two items, the cleaning of tubes and removal of boiler scale, are especially liable to neglect and a continual check is absolutely necessary.

Talks on fuel economy in industrial and power plants are nothing new. The United States Bureau of Mines has been preaching it for years. In fact, some of the best books in circulation on fuel conservation have been prepared by the bureau. These books are easily available on the payment of a nominal fee, and it might be well to circulate them among the boiler-room men.

The coal shortage problem is a difficult one and will remain so for the duration of the war. In some plants by means of careful firing methods and by keeping the boilers clean and in good repair the losses can be reduced 10 per cent and in some plants even 15 per cent. At least 250,000,000 tons of coal is annually used in the United States for making steam in stationary plants, so that a saving of 15 per cent would amount to 37,500,000 tons, which is considerably more than all the coal mined at present in France. In large plants, of course, some cognizance has been given to fuel conservation, and resort is made to comprehensive records, without which real fuel economy is impossible. It is in the large number of small hand-fired stations that indifference to fuel-saving methods has been so appalling. It is high time for many of these small stations to "get on the band wagon" and practice fuel economy.

FUEL ECONOMY PRECEPTS

The following oft-repeated fuel-economy precepts for hand firing with soft coal may be worthy of one more repetition. Technical Paper No. 80, on "Hand Firing Soft Coal Under Power Plant Boilers," published by the Bureau of Mines, Department of the Interior, contains a wealth of material on the same subject:*

1. Fire small quantities at a time at short intervals.
2. Keep the fuel bed even by placing the coal on the thin spots of the fuel bed and avoid raking and slicing the fuel bed.
3. Keep the fuel bed about 6 in. (15.2 cm.) deep.
4. Control the steam pressure by regulating the draft, and regulate the draft by the draft damper in the uptake. Have the damper nearly closed when the fire is banked.
5. Clean fires when the demand for steam is small, and while cleaning have the draft damper partly closed.
6. Look out for leaks in brick work.

In the present emergency the big drive must be made on the man in the boiler room and the man behind the shovel. Strict records on the amount of coal used and steam produced from this coal should be kept. The men

*The Fuel Administration has a limited number of these papers for free distribution. Apply to the Fuel Engineering Division, Bureau of Conservation, Fuel Administration, Washington, D. C.

in the boiler room must be made to understand that their jobs are important and not for the fly-by-night individual. Shorter hours, better pay and better working conditions—in a word, just what men in other parts of the plant are getting—will help the men to be contented with their jobs and stay at them, take a keen interest in fuel conservation and become skilled workers who will save many times the actual cost of increased wages and other innovations by the saving of many tons of coal.

LARGE OUTDOOR SUBSTATION ERECTED AT CANTON, OHIO

This Arrangement Is Made by the Central Station in That City for the Electrical Supply of Important Industrial Customer

The outdoor substation recently constructed by the Central Power Company at Canton, Ohio, to supply power to the plant of the United Alloy Steel Company is a fine example of modern practice and is one of the largest stations ever installed to supply a single consumer. It was designed for continuous service since the slightest interruption would be disastrous to stock, equipment and possibly life in the operation of open hearths, elec tric furnaces or rolling mills.

The present installation consists of seven 3000-kva. air-cooled transformers, connected in two banks of three each, with the seventh transformer available as a spare. Power is supplied from three 22,000-volt lines, protected by electrolytic arresters, to the incoming bus, and from this bus through automatic oil circuit breakers to the separate transformer banks. From the transformers other oil breakers make connection to the low-

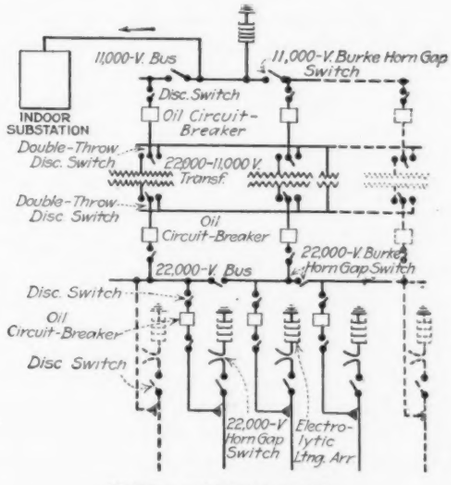


FIG. 1—ONE-LINE DIAGRAM OF SUBSTATION CONNECTIONS
Note the arrangement for replacing any transformer by the spare.

tension bus, which is carried inside the small building housing the distribution switchboard, relays, metering equipment, etc.

Both high-tension and low-tension busbars are sectionalized by Burke horn-gap switches. These are supplemented by disconnecting switches which give complete flexibility to the installation. Owing to the fluctuating nature of the load caused by the operation of electric furnaces, a 15,000-hp. blooming-mill motor and a 4200-hp. Morgan mill motor, it was considered advisable to dispense with overload protection of the transformer banks. Differential protection has been instituted and is operating very satisfactorily. The protection is effected by current transformers in both the high and the low sides of the transformer banks with such ratios that under normal conditions the secondaries ex-

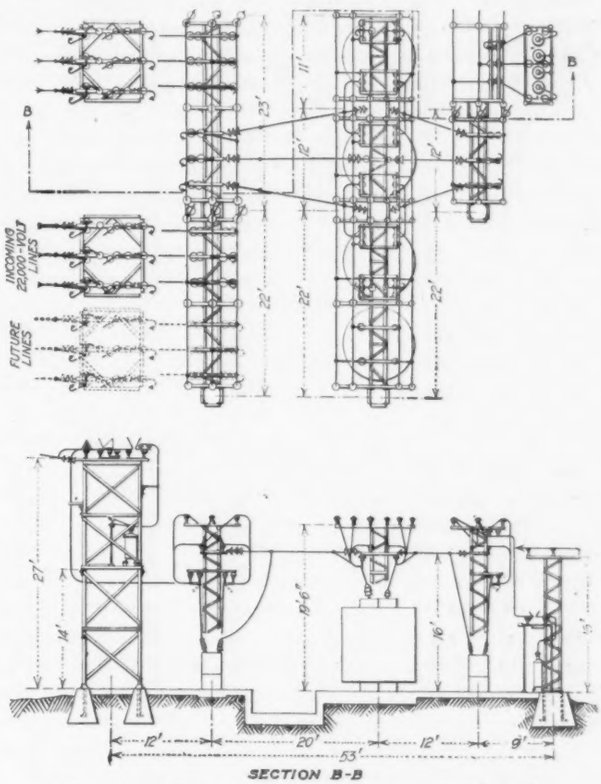


FIG. 2—PLAN AND ELEVATION OF SUBSTATION
For very important service the substation should be simple, accessible and logically arranged. These reqirements are well met in this installation.

actly neutralize each other. In the event of the slightest ground or failure in either the primary or secondary winding of any transformer this balance is destroyed, causing the relay to operate and tripping both high-tension and low-tension oil switches, thus isolating the bank and saving it from further destruction without interrupting the service. The line feeders are equipped with reverse power relays. All protective devices are operated by alternating current.

A unique feature is the arrangement of connections for the spare transformer. High-tension and low-tension leads from the spare are carried over all the other transformers, and double-throw disconnecting switches allow the immediate use of the spare in place of any one of the other six. The station is designed on the unit principle, and as other transformers are added the spare transfer bus will be extended to protect them also.

Westinghouse transformers, oil circuit breakers and electrolytic arresters are used. The rest of the equipment was furnished by the Railway & Industrial Engineering Company, which also designed the station in conjunction with the Central Power Company. The installation was made by the Central Power Company under the supervision of William M. Hornlein, electrical engineer of this company.

Conservation of Fuel in California

By Interconnection of Systems with Different Load Characteristics One Company Alone Will Save Nearly a Million Barrels of Fuel Oil—Hydroelectric Development Must Continue to Meet Growing Demand for Energy

BY R. J. C. WOOD
Superintendent of Generation, Southern California Edison Company

FUEL once consumed is not recoverable and the supply is decreasing while its cost is increasing. On the other hand, stream flow is not depreciated by its utilization for power purposes and the supply is practically inexhaustible. Much may be accomplished toward saving fuel in California by interconnection, on account of the excellent diversity of loads between different systems. As a striking example of this difference in load characteristics the San Joaquin Light & Power Corporation and the Southern California Edison Company may be cited. The San Joaquin load is mainly due to summer pumping, while the peak load of the Edison company occurs about November. Thus the San Joaquin plants carry a considerable part of the Edison company's load in the winter time and the Edison company reciprocates in the summer. The use of steam reserve plants is thus greatly reduced, less water flows uselessly past the hydroelectric plants and fuel oil is conserved in substantial measure.

The rivers in the southern part of California are of most variable flow, and for this reason a great portion of their run-off is lost as flood water. There exist good storage sites on Big Creek, one of which has been developed to 88,000 acre-feet (10,800-hectare-m.) at Huntington Lake. Further south, reservoir locations are comparatively few, the Big Bear Valley reservoir and the reservoirs of the Los Angeles Aqueduct being the only ones serving hydroelectric plants of any magnitude. The Little Bear Valley reservoir has not as yet been put to use in connection with power development, and reservoir sites that have been proposed on the Mojave and Sespe Rivers for irrigation projects are not yet developed.

IRRIGATION AND HYDROELECTRIC COMBINED SYSTEM

The combination of an irrigation with a power project is not always so advantageous as might at first appear. In those projects where the whole run-off of the stream is stored it is apparent that power will only be available during the irrigating season. This in itself is not a serious disadvantage because the power then generated can be used for pumping purposes on lands not under gravity flow. The inherent disadvantage lies in the fact that the power plant operates under a load factor of not more than 50 per cent and to utilize the water it must have a capacity twice as large as would suffice if the water had uniform flow. Further difficulties arise in keeping together an operating organization that is idle half the year.

For immediate relief scientific operation of those storage and power sites now existing is necessary, to be followed by the building of new plants as funds become available. Each power company considered individually can do little more than it has in the past; none have wasted water in order to pay money for fuel, but many cases have existed where the water power could not all be absorbed at certain times of the day or seasons of the year, particularly where there was no adequate water storage, and great waste ensued. Combinations by the interconnection of systems of different companies and storage systems have resulted in the diversity of loads and available generating capacities being utilized to full advantage. The insurance factor has also been increased, partly offsetting the shut-down of the smaller stand-by steam plants.

Before the present urgent necessity for general conservation arose, a high standard of service had been established. In times like the present, this standard must be relaxed and the reducing of the quality of service by but a fraction of a per cent will release an amount of money for more urgent purposes which would more than offset the inconvenience due to the lowering of the standards.

ECONOMIES MADE POSSIBLE BY INTERCONNECTION

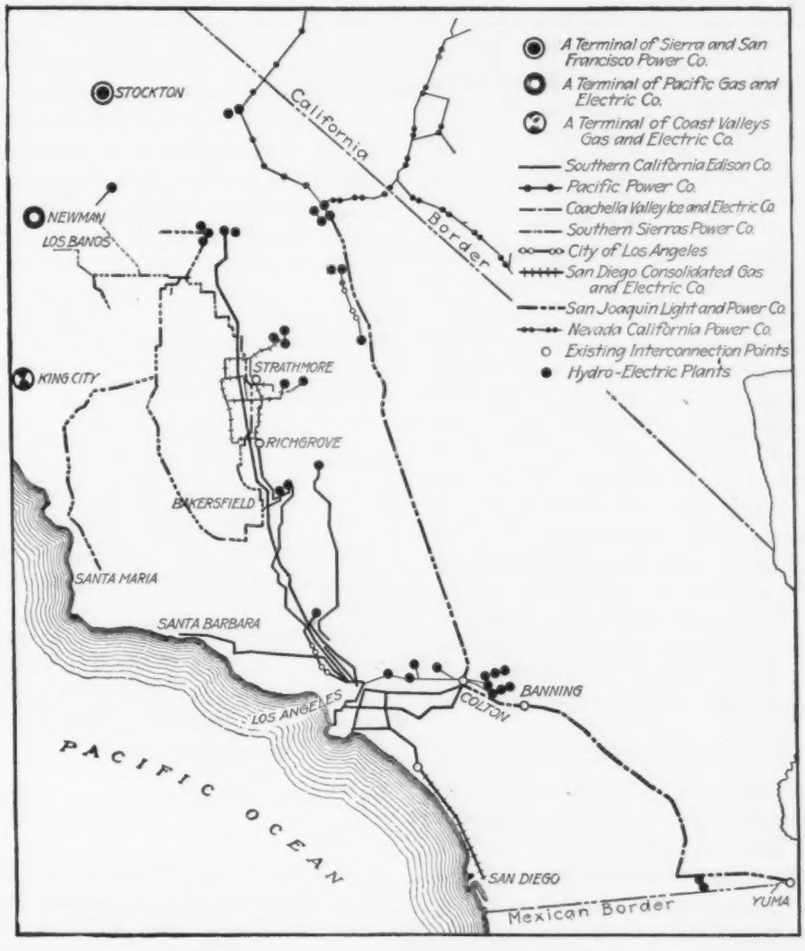
At the present time the Southern California Edison Company, city of Los Angeles, Southern Sierras Power Company, San Joaquin Light & Power Corporation and Mount Whitney Power & Electric Company are all interconnected, and the Santa Barbara Gas & Electric Company and San Diego Consolidated Gas & Electric Company interconnections with the Southern California Edison Company are under way.

The interchange of energy between the Southern California Edison Company and the San Joaquin Light & Power Corporation well illustrates the fact that storage capacities become doubly useful when the systems are interconnected. We may conceive of the waters of Kern River that pass through the San Joaquin Company's power house being electrically transmitted to Huntington Lake, the reservoir for the Big Creek plants, 150 miles (241 km.) away, and at the same time conserving many barrels of oil per day while this condition exists. Storage on the Los Angeles Aqueduct system is also used to conserve water that would otherwise be wasted on Kern River between 1 and 6 a.m., the method of operation being to reduce the aqueduct output to a minimum during these hours and supply power from Kern River, an equivalent amount being generated by the Aqueduct plants during the remainder of the day in excess of the normal output so that the daily output remains the same, resulting in the conservation of both water power and oil fuel.

The completion of the transmission line to Santa Barbara will enable the Santa Barbara Gas & Electric Company to get its entire supply of 7,000,000 kw.-hr. over this line, saving the equivalent of at least the difference in economies between the Santa Barbara and Long Beach steam plants, and at certain times of year substituting water for steam power. This is not a clear saving to the companies involved, as maintenance and fixed charges on the transmission line and some dif-

ference in steam plant costs other than oil must be deducted before the net economic result is arrived at. Connection with the Southern Sierras Power Company through a 5000-kw. frequency changer at Colton will make possible a reduction in steam production of 20,000,000 kw.-hr. per year.

In a similar manner to the Santa Barbara case, steam load will be transferred from the San Diego Consolidated Gas & Electric Company to the Long Beach steam plant when physical interconnection is made between the two companies, delays in the shipment of frequency changers being responsible for the postponement of this operation. Probably some 25,000,000 kw.-hr. will be furnished annually in this manner, resulting in an approximate saving of 40,000 bbl. of oil annually. Here again the net results upon the companies' balance sheet must include all charges upon the line and frequency changer installation. The city of Los Angeles has some small plants at Owens River Valley which could be connected to the Southern Sierras system, utilizing 10,000,000 kw.-hr. per annum. A direct saving of flood water has been effected by raising the Big Creek dams which increased the storage by 35,000 acre-feet (4300 hectare-m.) The new River plant of the Los Angeles Aqueduct will supply 15,000,000 kw.-hr. annually, and the arrangements that will increase the output of the San Francisquito plant will add 30,000,000 kw.-hr. to the hydroelectric output of 1918.



ELECTRIC-SERVICE SYSTEMS IN SOUTHERN CALIFORNIA THAT ARE INTERCONNECTED

In addition to these savings which are being effected by interconnection and intelligent load dispatching, there is a possible increase in the use of natural gas, and the San Joaquin company is preparing to utilize 600,000,000 cu.ft. (17,000,000 cu.m.) per annum, one-half of which will be available during 1918 and the whole quantity in 1919. The Southern California Edison Company is also using at Redondo 800,000 cu.ft. (22,600 cu.m.) of gas per day obtained from its own properties in the La Brea field. When all these economies and additions are totaled it is estimated that the fuel-oil consumption will fall from 1,056,000 bbl. in 1917 to 275,000 bbl. in 1918, a reduction of 781,000 bbl. despite the fact that the combined load of the southern California companies will increase from 1,146,000,000 kw.-hr. in 1917 to 1,270,000,000 kw.-hr. in 1918.

AN ECONOMICAL STEAM PLANT

Reference has been made to the transfer of load from smaller steam plants to the Long Beach steam plant. This plant was started in August, 1911, with one 12,000-kw. turbine. So urgent was its need that the main switch was erected in the turbine room supported on packing cases and temporary leads were run out of the window, and before the second unit, a 15,000-kw. machine, could be put into operation in 1913, No. 1 was carrying 14,000 kw. continuously. Not until the third unit of 20,000 kw. was installed in April, 1914, was there any margin for repairs or emergencies. The annual efficiency of this plant has been maintained satisfactorily, being as given in Table I. Probably the greatest sources of inefficiency are poor fuel consumption, low vacuum and turbine blade incrustation or corrosion. In this plant boiler-room economy is enhanced by equipping each boiler with steam flow meter, CO_2 indicator and recorder, draft gage, flue-gas thermometer and superheated-steam thermometer. Their records are carefully checked every day and the operation of the different shifts of firemen compared.

The total feed water to each set of boilers supplying steam to each turbine is separately metered by an indicating and recording Venturi meter. Fuel oil is measured by tank levels every hour, and as all switchboard meters are read every half hour, it is easy to compute the over-all plant economy for every hour of the day, which is done regularly and shown on the same chart which gives the load curve for the day.

In order to locate the cause of possible low vacuum, the circulating water is measured by a Venturi meter. Some special problems had to be met on account of the

whole circulating system being under a vacuum, necessitating the placing of the indicating mechanism below the circulating pipes in the basement, and connecting it by fine cable to the recording stand which is on the turbine-room floor.

The actual condition of the turbine blading is judged by the steam rate, so weighing tanks are made a permanent part of the equipment to permit making tests on any turbine without interfering with normal operation.

TABLE I—AVERAGE ANNUAL EFFICIENCY—LONG BEACH STEAM PLANT

Year	1912	1913	1914	1915	1916	1917
Units in operetion	No. 1	No. 1 11 mo.	Nos. 1, 2 No. 2 8 mo.	Nos. 1, 2, 3 No. 3	Nos. 1, 2, 3	Nos. 1, 2, 3
Kilowatt-hours generated*	50,300,069	94,046,697	74,811,625	77,555,811	45,359,582	133,638,173
Bbl. of oil consumed	240,537	439,454	347,007	328,749	218,235	562,153
Kilowatt-hours per barrel	219	214	215	236	208	237.5

*Kilowatt-hours generated is output of turbines less power consumed by motor-driven auxiliaries.

This equipment has proved its worth and drawn attention to conditions that might otherwise have been difficult to locate so definitely. Once a year, when load conditions permit, a turbine side is removed to permit examination of the blades.

Since the three turbines have different steam consumption characteristics a graphic chart has been prepared which shows at a glance how much load each should carry for any total station load. Each turbine and its boilers are laid out for unit operation, but on account of the greater efficiency of the No. 3 set of boilers, which are equipped with economizers, cross-over connections enable the No. 3 boilers to furnish steam to any turbine and permit of the return of the condensate.

CHECKS ON OPERATING ECONOMY

In addition to such checks upon operation as are regularly applied by the local combustion engineer, the kilowatt-hours output and fuel consumed by each unit are telephoned to the load dispatcher each night, and the superintendent has the figures early the next morning for the previous day's operation.

Output and fuel are plotted, not as kilowatt-hours per barrel, but against each other, and for normal operation fall on a straight line. Any material departure from the line is evidence that something is wrong, and the cause is immediately investigated. The expression of kilowatt-hours per barrel is worthless as a criterion of efficiency because the load factor is a determining quantity. As a matter of fact, an efficiency of 150 kw.-hr. per barrel on a Sunday might be better operation than 250 kw.-hr. per barrel on a Tuesday. This same method is applied to monthly and yearly operation, and it is remarkable how uniformly the points fall on the line, provided no changes are made in equipment and so long as no deterioration of apparatus or operation occurs.

Poor operation might increase the fuel consumption by 5 per cent and for the year 1917 this would have amounted to 28,100 barrels of oil. While this is a considerable quantity of oil, representing many dollars, yet this and the various oil savings previously enumerated are small compared to what the increases in oil consumption would amount to in the future by reason of the growth of the business, and they would probably be absorbed by 1920 unless provision were made for relief.

The estimated oil requirements for southern California power companies after making the interconnection economies are shown in Table II.

TABLE II—ESTIMATED OIL REQUIREMENTS AFTER INTERCONNECTION*

Year	1917	1918	1919	1920
Barrels oil	1,056,000	275,000	735,000	1,510,000

*Partial interconnection occurred between 1917 and 1918.

Relief is thus imperative, and the obvious course to pursue is to develop more water power. The projects which can be most quickly developed or extended and the kilowatt-hours obtainable are indicated in the tabulation which follows:

	Kw.-Hr.
Los Angeles Aqueduct	105,000,000
Edison Company, Kern River No. 3	180,000,000
Edison Company, Pitman Creek	32,000,000
Edison Company, new reservoir on Big Creek and one additional generating unit	96,000,000

These increases could not all be wholly obtained for the year 1919, nor is this necessary, but by a progressive development which would be largely determined by the deliveries of machinery obtainable, the fuel consumption in the years 1919 and 1920 might be reduced to a small quantity for stand-by purposes and might even be eliminated.

The expenditures necessary to provide for the hydroelectric program of the Southern California Edison Company, as detailed herein, total $11,000,000 and this development and outlay has been sanctioned by the State Railroad Commission.

If the miners will keep [weekly] production over 13,000,000 tons from this time on, we will win the fight. The week's record [13,243,000 tons of bituminous coal in the week ended July 13] was a big tribute to what America can do when faced by a crisis. It is the final blow at Germany. We are fighting to give the shipyards, the airplane plants, the munition plants and every arm of the government which is dealing Germany blow upon blow enough fuel to keep them going at top speed. And with the aid of the miners we can accomplish that task. I ask only that they keep it up and I will fight with them with everything there is in me. Germany is beaten, and nothing can drive that message home to the followers of the Kaiser more surely than the knowledge that our industries will not be balked by the lack of fuel. We will win this fight.—*Dr. H. A. Garfield, Federal Fuel Administrator.*

Analysis of Electric Cooking Situation

Central Station with Largest Number of Range Customers on Its Lines Possessed by Any Company in the United States Gets Satisfactory Results from Investigation Along These Lines

BY S. M. KENNEDY
General Agent Southern California Edison Company, Los Angeles, Cal.

THE Southern California Edison Company, which by the way has more electric ranges on its lines by over 1000 than any other central station in the United States, sold over 3000 electric ranges in the period of two and one-half years ended May 1, 1918, an average of a hundred ranges per month. Owing to the changed conditions on account of the war it became necessary to analyze closely all classes of business development and to discontinue any that might be termed experimental or unprofitable. With this in mind a canvass was made of the electric cooking situation and the value of the load.

The company's system is divided into twenty-four geographical districts, each district being a complete unit in itself in so far as local operations are concerned. The company maintains fifty district and sub-offices, so that its consumers may be conveniently and effiiciently served in all parts of the country covered by distribution lines.

The electric cooking development has been carried on in each of the twenty-four districts, and the number of electric ranges installed varies from twenty as the minimum number to 333 as the maximum number in any district. In twelve districts there are fewer than 100 electric ranges in each; six districts have between 100 and 200 ranges in each. Five districts have between 200 and 300 ranges in each, and one district has in excess of 300 ranges. This indicates a large distribution of ranges over a wide territory and the supplying of service under many and varying conditions.

RESULTS OF QUESTIONNAIRE

Recently a list of questions was sent to each district agent regarding electric range installations and service, and the replies received have been considered eminently satisfactory to the company. The questions and the substance of the answers that were received are as follows:

1. "How many electric ranges are now in use in your district?" The replies varied from 20 to 333, the total amounting to 3040.

2. "What percentage of consumers using electric ranges in your district are satisfied with the service? This, of course, means the utility of the range and the size of the bills." The replies indicated that over 95 per cent of electric range consumers are satisfied.

3. "As a result of your experience, what do you consider are the strong points in the use of the electric range—that is, what commends the electric range to consumers?" Replies mentioned the following points, given in the order of importance: Cleanliness, convenience and ease of operation, absence of heat in summer, safety, saving of food and retention of flavor, automatic feature, no smoke, cost of operation, hygiene, accuracy.

4. "What do you consider are the weak points in the use of the electric range—that is, what features are a trouble or annoyance to consumers?" Replies, given in order of importance: Burn-outs of elements, burn-outs of fuses, slow top-burner heating, bricks cracking, broken switches, discoloration of oven linings, replacements too slow, unreliable thermostats, leaky oven doors.

5. "Are the electric ranges now installed in your district doing good advertising work for electric cooking, and are they influencing the sales of other ranges?" The replies clearly indicated that the ranges now installed were the best advertisers and the ablest salesmen the company had. Many range sales were made without solicitation, being entirely influenced by the praises of neighbors.

6. "Have you any suggestions to make which might tend to improve the utility of the electric range?" The suggestions were numerous, and those from different parts of the system were remarkably similar. Some of these were: More heat in at least one top burner, plenty of replacements on hand, non-rusting ovens, extra simmering burner, pilot light, units more rugged and reliable, steam vents.

Of the total number of electric ranges sold on the Edison system, only 155, or about 5 per cent, are installed in apartment houses. Experience has demonstrated that, while the apartment-house load can be satisfactorily handled, it causes the company probably four times as many troubles per range in use as do installations in private houses. Apparently the average tenant in an apartment house does not take so much interest in keeping the range in good order as does the owner of a private house. Further, the apartment-house occupants frequently come and go, and as a rule they do not study electric cooking sufficiently to get the best results. Consequently the troubleman and the demonstrator must make frequent visits to apartment-house installations.

The reports concerning the operation of 3000 electric ranges on its system have demonstrated to the Southern California Edison Company that (a) the electric cooking load is a desirable load if the rates for service are equitable; (b) the electric range is satisfactory to its consumers, and (c) electric cooking service is along the lines of conservation of both food and fuel.

The company has been slow to consider any reduction in rate for cooking service from the schedule put into effect two and one-half years ago. The schedule for private houses, a combination one, supplying lighting and cooking service through one meter, is as follows:

Primary Charge—Houses of five rooms or less, first 20 kw.-hr. per month, 7 cents per kilowatt-hour; houses of six and seven rooms, first 30 kw.-hr. per month, 7 cents per kilowatt-hour; houses of eight rooms and over, first 40 kw.-hr. per month, 7 cents per kilowatt-hour.

Secondary Charge—All energy used in excess of first block (lighting requirements), 3½ cents per kilowatt-hour.

When an electric water heater is installed along with an electric range, a rate of 2 cents per kilowatt-hour is made for all energy used in excess of 100 kw.-hr. required for cooking purposes. The company has about 700 of such combination range and water-heater installations.

While rates considerably lower than the foregoing have been put into effect by some companies having fairly large cooking loads, the Edison company has not considered any lower schedule justifiable for this service. There is an additional capital investment represented in each installation. There are additional troubles in handling the service, and expert demonstrators must be maintained to educate purchasers how to cook electrically and do it efficiently and economically. All this means extra expense, which must be fully covered by the revenue obtained from the service.

The average annual bill for electric cooking on the Edison system is around $45, and for combination cooking and water heating the average is $75. The question of cost of operation and the fear of high bills does not figure nearly as much now as when electric cooking was less known. The prospective expense is by no means overlooked by new consumers, but most of them know what it is actually costing some friend or neighbor. Then again the knowledge of the compensating advantages of electric cooking is spreading. Gas may be a cheaper means of lighting than electricity, yet in most localities the public insists on electric lighting where it is available. There are strong indications that the same preference will be developed for electric cooking.

Under normal conditions the Southern California Edison Company would have sold 2000 electric ranges in 1918 and could have accomplished this task more easily than it could sell 500 ranges two years ago. But these are abnormal times, and certain restrictions have been imposed which must keep sales down to a minimum. The difficulty in financing expenditures and the increased cost and scarcity of materials and labor must be considered as determining factors in deciding the amount of electric cooking load which may be added. Consequently, the company is not seeking additions, but rather is endeavoring to take care of only such business as may be offered. Satisfactory progress has been made in building up a cooking load on the company's system, and under more favorable conditions every reasonable effort would be made to increase the load as rapidly as possible. Until conditions change the business already connected will be nursed and cultivated so that when the right time arrives there will probably be an insistent demand for electric ranges resulting from the advertising done by present installations.

In the light of the President's proclamation appearing in the press on April 16, 1917, the work of the American power companies takes on the significance of national service. Recognized as an important part of what the President has termed "a great national, a great international service army" because of their close and necessary relationship to the industrial forces of the country, the power companies to-day stand ready to perform whatever may be required of them in the service of the nation. It is because of this that service in the power companies takes on the significance of national service.—*Joseph B. McCall, President Philadelphia Electric Company.*

ELECTRICAL DEVELOPMENTS IN THE CENTRAL EMPIRES

Concessions for Water Power Given for a Period of Sixty Years and Provision Is Made for Government Ownership

A recent issue of the British *Board of Trade Journal* contains a survey of German and Austrian plans for the reorganization of the central-station supply of electricity. Various proposals have been drawn up for an imperial monopoly or some form of central control, but the individual states have been too jealous of the imperial power to support them. So far as progress has been made it is due to the independent action of the states.

Württemberg is planning a consolidation of central stations, the state participating in the administration. In Saxony the state decided to carry out consolidation by means of state central station, the directorate to form a part of the Ministry of Finance and the work to be carried out under the supervision of a national electrical council on which technical experts and representatives of large consumers are to sit. Bavaria shows private enterprise in a more active form. The Deutsche Bank and the Allgemeine Elektrizitäts Gesellschaft have prepared plans for the development immediately after the war of Bavarian water power at a cost of about $30,000,000.

A bill was introduced toward the end of last year in Prussia enabling the government to take over the generating stations and main transmission lines, leaving the distribution lines in the hands of municipal and private enterprises. Provincial and district committees are suggested for the purpose of preparing and carrying out systematic schemes.

The Austrian government has drafted a bill for remedying the backward state of electrical enterprise, particularly with regard to the use of water power. The object aimed at is to secure a uniform and economical supply of electricity, and with this in view all future concessions will be controlled. Public and semi-public undertakings will be able to obtain concessions for a period of ninety years; companies will be limited to sixty years. Provision is made for financial aid by the state, for the supervision of rates and for state participation in the profits where state privileges are granted. Companies will be allowed to keep their profits up to 6 per cent on the capital; between 6 and 10 per cent the state will take one-third of the profits, and over 10 per cent it will take half. Provision is also made for state purchase on the "then value" at the end of twenty-five years and every five years afterward of undertakings using public waters or state sources of energy.

Books Received

ABOVE THE BATTLE. By Captain Vivian Drake. New York: D. Appleton & Company, 322 pages. Price, $1.50 net.

1918 MCGRAW LIST OF ELECTRICAL SUPPLY DEALERS, CONTRACTORS AND JOBBERS. New York: McGraw-Hill Company, Inc. Price, $10.

THE FINANCING OF PUBLIC SERVICE CORPORATIONS. By Milton B. Ignatius. New York: Ronald Press Company. 508 pages. Price, $5.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

PAVING OF A STREET CAUSES CABLE TROUBLE

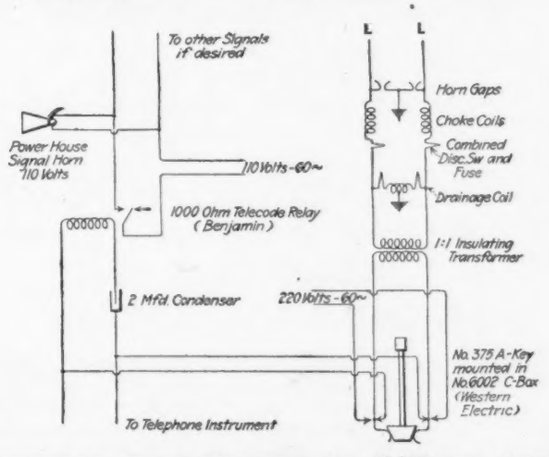
Radiation of Heat Is Reduced by Placing Pavement Over Duct Line and New Ducts Are Made Necessary

On a thirty-six-duct line from its generating station a Central States utility company had no trouble until the street under which the conduit was laid was paved. The pavement so far reduced radiation from the conduit that the circuit loading had to be appreciably reduced. On account of this enforced reduction in loading it soon became necessary to build a new duct line, this being placed under the sidewalk. This sort of construction was found to cost less and the radiation was more satisfactory because of dampness near the buildings.

MEANS FOR PREVENTING INDUCTIVE INTERFERENCE

Overcoming Inductive Interference and Signaling Troubles on Telephone Line on Same Poles with 40,000-Volt High-Tension Circuit

On its 35-mile (56-km.) private telephone line, the Otter Tail Power Company of Fergus Falls, Minn., is using the scheme of connections shown in the accompanying sketch to eliminate inductive interference from a 40,000-volt transmission circuit which is strung on the same pole line and only 5 ft. (1.5 m.) above the telephone wires.



CONNECTIONS WHERE TELEPHONE AND 40,000-VOLT CIRCUITS ARE ON SAME POLES

The trouble was remedied to a large extent by the use of drainage coils, with telephone transpositions every four poles, but the feature of the scheme is the use of a No. 375-A Western Electric key through which the signaling current is supplied from a 220-volt, 60-cycle source. Previously the company had considerable trouble in transmitting sufficient energy over the telephone circuit from the hand generator to give distinct signals in a noisy power house at the distant end of the line. It will be observed that the signaling key now cuts out the local telephone apparatus.

To pick up the signals the company has installed at each station a 1000-ohm Benjamin "Telecode" relay with a 2-mfd. condenser in series with it. This relay in turn closes a 110-volt, 60-cycle circuit operating the 110-volt signal horns. As many signals may be connected in the 110-volt circuit as desired.

In commenting upon the success of this scheme, A. V. Taylor, electrical engineer of the company, said that "while this key is not built especially for 220-volt service, we have had only one case of trouble which has developed from the installation of these keys."

OPINION ON HIGH-TENSION SWITCHING AND PROTECTION

Methods and Practices to Be Followed and Apparatus to Be Selected for Outdoor Substations Discussed by Ohio Operating Men

Switching and overload protection on systems operating at 22,000 volts or less are generally accomplished by means of automatic oil switches and current transformers in larger installations. But in smaller ones air-break disconnecting switches are many times employed because of their lower cost. The air-break switch may be arranged for either direct or remote control, hand or motor operation. It is often employed in disconnecting oil switches and transformers from live lines and in emergencies may be used to disconnect a load from the lines. However, it is not advisable to disconnect heavy loads or long transmissions lines with heavy charging current, say a number of Ohio operating men, because of the difficulty of extinguishing the arc produced by opening the blades of the switch. The air-break switch has been used to advantage on short lines or light loads.

There are two methods of breaking the arc with this type switch, (1) horizontal break and (2) the vertical break. The vertical-break switch requires less space; it breaks the arc more naturally than the horizontal break. The horizontal break requires a wider separation. This in turn requires a larger supporting structure and therefore a greater initial expense.

The overload protection obtained by the use of automatic oil switch and current transformers is no doubt the best form of protection available, and it is essential in the larger systems. On smaller systems this expense is not permitted so the fuse has been developed. Fuse protection is not very satisfactory, however, in

that most fuses already developed have some detrimental characteristics. The expulsion-type fuse, using a fiber tube, carbonizes after continued use, thus offering a path for the flow of current which in turn causes the complete destruction of the holder.

With the horn-gap fuse, which is made up of two horns bent into a "V" shape with a gap bridged by a piece of fuse wire, a surge is set up with each overload which is severe on all apparatus. This type of fuse requires large spacing to prevent jumping between phases or to ground. The principal advantage is its low initial cost and the relatively low expense of fuse renewals.

The carbon tetrachloride fuse readily destroys the arc developed by the fuse section blowing, but its ampere capacity is rather small, being about the same as that of the expulsion fuse. The disadvantage of this type of fuse is the high cost of renewal.

With these opinions and recommendations, which were presented to the Ohio Electric Light Association by the transmission and distribution committees, Fred Alsaker, of the Delta Star Electric Company, took issue in part, saying: "The carbon tetrachloride fuse will open a circuit in 0.013 second as against 0.16 second with a modern circuit-breaker. This prevents destructive energy from reaching apparatus. To get action identical with circuit-breaker protection as regards speed, a fuse rated at twelve times the full-load capacity of the circuit can be used. This will of course reduce renewal expense. When this plan is used, circuit breakers should be employed on the low-tension side of transformers. Carbon tetrachloride fuses are made in standard sizes up to 200 amp. and in special sizes to any rating."

SAFETY FOR LINEMEN

Practical Rules for Protection of Men Working with or Near High-Tension Transmission Conductors

A well-defined set of rules should be adopted by companies whose employees have to deal with circuits or apparatus operating at hazardous voltages. The load dispatcher or system operator should first see that a line to be worked on is opened, short-circuited, grounded and tagged before permitting any one to approach the work. Before climbing a pole a lineman should test it to see if it is substantial. Decay at the center of the pole may be determined by rapping it with a tool.

Great care must be exercised by workmen in getting through the wires, whether alive or not. It is advisable to assume a position from which one would fall clear of wires in case of accident. Insulated wires should be treated as bare and all conductors considered alive until they are known to be dead.

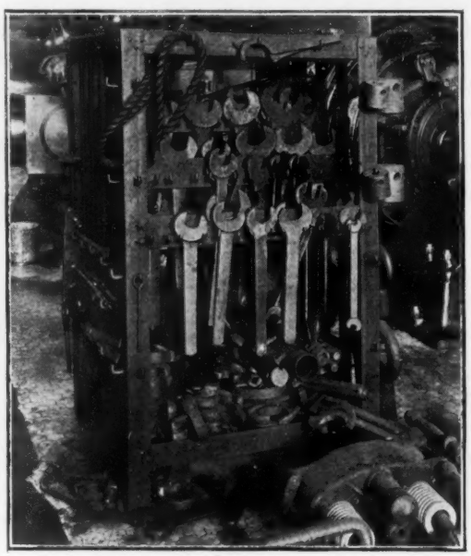
Especial attention should be given to the care and use of rubber gloves, for a very slight flaw may render them useless and consequently dangerous. Thus a lineman should never climb a pole with rubber gloves exposed to splinters. Some companies have their men wear three pairs of gloves for live work as follows: first light fabric gloves under the rubber gloves to protect the latter from finger nails, then leather gauntlet gloves over all for protection from without. This combination is said to be flexible and suitable for winter service.

These suggestions were given in a house organ published by the Consumers' Power Company of Michigan.

CONVENIENT TOOL CABINET

May Be Transferred from One Job to Another by Traveling Crane—Used by Connecticut Company

A convenient wrench cabinet in use at the Dutch Point plant of the Hartford (Conn.) Electric Light Company is illustrated herewith. The cabinet consists of a frame about 5 ft. (1.52 m.) high, 3 ft. (0.91 m.) wide and 3 ft. (0.91 m.) long, assembled from bolted angle-irons and provided with numerous hooks and cross-pieces accommodating any size of wrench desired. By installing the cross-pieces at three different heights front and back, in the step-up arrangement shown, the convenience of the cabinet is much increased. To a diagonal member across the top a hook is attached, permitting handling by the traveling crane, so that the wrenches, bolts, tools, etc., carried can be quickly concentrated at any particular job within the station. The lower part of the rack is arranged as a table for holding the lighter or more miscellaneous equipment shown. F. Wilbraham is chief engineer.



CABINET FOR POWER PLANT TOOLS

The main members are 3 in. by 3 in. by ¼ in. (7.6 cm. by 7.6 cm. by 0.63 cm.) in section and the intermediate or stiffening members are 2-in. by 2-in. (5.08-cm. by 5.08-cm.) angles of the same thickness.

RECLAIMING BOILER TUBES

Instead of Being Replaced, Leaking and Bagged Tubes Are Repaired with Oxy-Acetylene Torch

As many as fourteen welds have been made on one boiler tube before it was necessary to discard it. The method consists in slowly heating the bag to a bright cherry red with an oxy-acetylene torch and hammering the bag into shape, beginning at the outer edges and working toward the center. Sections of tubes are also welded on straight boiler tubes, thereby reclaiming the old tubes. The cost of welding is approximately 75 cents per single weld, including all labor, material and cost of setting up the apparatus. When several welds are made in one boiler the unit cost per weld is greatly reduced. It is also reported that crystallized boiler tubes are successfully annealed by heating to a bright cherry red, al-

lowing them to cool, and rerolling. A hammer test then shows that they are as soft as new tubes. This work was reported by William Long, superintendent of production, Toledo Railways & Light Company.

ADVANTAGES OF WOOD DUCT FOR UNDERGROUND SYSTEMS

Dielectric Qualities Found Adequate for Local Distribution Systems—Does Not Break So Easily as Fiber Duct

BY R. A. PAINE, JR.
General Foreman Detail and Record, Edison Electric Illuminating Company of Brooklyn

Although the dielectric qualities of wood duct are not so good as those of fiber duct, extensive testing has shown that they are sufficient for the requirements of low-voltage 115-230 volt distribution mains and services. Low installation and maintenance costs are obtained by the use of wood duct. The cost per unit length is only slightly greater than that of fiber and tile, and it requires no concrete envelope.

In the following tabulations of tests, creosoted wood duct, which is used by the telephone company, was adopted. Its inside diameter is 3⅛ in. (7.9 cm.), and it is 4½ in. (11.4 cm.) square on the outside.

BREAKDOWN TESTS

An alternating-current breakdown voltage test was made on four pieces of wood duct and four pieces of fiber duct in order to show the comparative insulating value of wood and fiber duct. Pieces No. 1 were sealed at one end, filled with water and allowed to stand forty-eight hours. Pieces No. 2 were sealed at one end, placed in a barrel of water, keeping the inside duct dry, and allowed to stand forty-eight hours. Pieces No. 3 were placed in a barrel of water, allowing inside and outside of duct to be in contact with water for forty-eight hours. Pieces No. 4 were taken from stock.

Three test sections were taken from each piece, using tinfoil electrodes and increasing the voltage by steps of 500 volts after each minute, and the following average breakdown values were obtained:

	Piece No. 1	Piece No. 2	Piece No. 3	Piece No. 4
Fiber duct	9,300	8,700	4,300	*
Wood duct	1,000	1,000	800	2,200

*Piece No. 4 of the fiber duct withstood 11,500 volts for five minutes.

RESISTANCE TO SHORT CIRCUIT

The resistance of wood duct to arcs as compared with fiber was determined by the following tests: To determine what the results would be if a short circuit occurred on distributing mains in the duct, three legs of 150,000-circ.mil R. & L. cable were placed in fiber duct and punctured so that they would short-circuit. A slow-burning short resulted, when they were connected to the source of energy, which burned three holes in the bottom of the duct, the fiber bursting into flame. This flame would probably have consumed the whole piece of duct, but it burned so fiercely that it had to be extinguished.

For the same experiments with wood three lengths of the duct that had been soaked in water for five days and two stock lengths were tested. Three legs of 150,000-circ.mil R. & L. cable were placed in the ducts and punctured so that they would short-circuit. A very high temperature was generated in the ducts when they were connected to the mains, and this was allowed to increase until the cables burned in half and cleared themselves. This operation was repeated four times, twice over the joint and twice in the middle of the length on both the water-soaked and the dry duct. From the water-soaked duct a relatively small amount of thick black smoke or gas was generated at each short. This smoke or gas did not seem to be combustible, and the duct was in very nearly perfect condition after the test. A very large amount of greenish white smoke was liberated at each short in the dry duct. One short burned for five minutes, destroyed two cables and filled up the bottom of the duct with molten copper and lead. After this short the duct smoldered near the joint, liberating a large amount of smoke.

It was shown that the wooden duct was better than fiber in case of a short circuit occurring in the conduit, because the latter may easily be entirely destroyed. The durability of wooden duct is apparent from the extensive use and experience which telephone companies have had with it.

ESTIMATED SAVING EFFECTED BY USE OF SOOT CLEANER

Tons of Coal Saved per Foot of Pipe Gives Basis for Soot-Cleaner Calculations—Labor Saved Is Considerable

According to a soot-cleaner manufacturer, approximately 18.3 tons of coal is saved by each foot of pipe during the lifetime of the cleaner. In addition, it is said that each foot of pipe eliminates one man's labor each day which is usually required to blow the pipes with steam. Since the average water-tube boiler requires about 200 ft. (61 m.) of pipe, it is not difficult to compute the total money saved or the money saved by the reduction of labor cost alone on the above basis. If it is assumed that boiler-room labor can be secured at $2 per day, the labor saving with the average cleaner is $400 for the lifetime of the cleaner. As for coal saving, if we assume the price of coal to be $4 per ton and 200 ft. of pipe per cleaner, the money saving for the lifetime of the cleaner will be about $14,600. This amount added to the labor saving makes the total $15,000.

Although these figures vary with labor and coal cost, they can easily be adjusted to suit any conditions. The estimates are made for boilers operated at 140 per cent rating with an average coal consumption of 4 lb. (1.8 kg.) per boiler-horsepower per hour, boilers operating twenty-four hours per day and 325 days per year. The further assumption that the life of a cleaner is seven years is verified by the experience of the United Electric Light & Power Company, New York City, which installed soot cleaners on thirty-two boilers five years ago, the cleaners having shown only slight signs of wear. Moreover, cleaners now made have a much higher safety factor than those installed five years ago because of the cast-iron-sheathed elements with which they are now equipped.

The above information is given by the Vulcan Soot Cleaner Company of Dubois, Pa.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

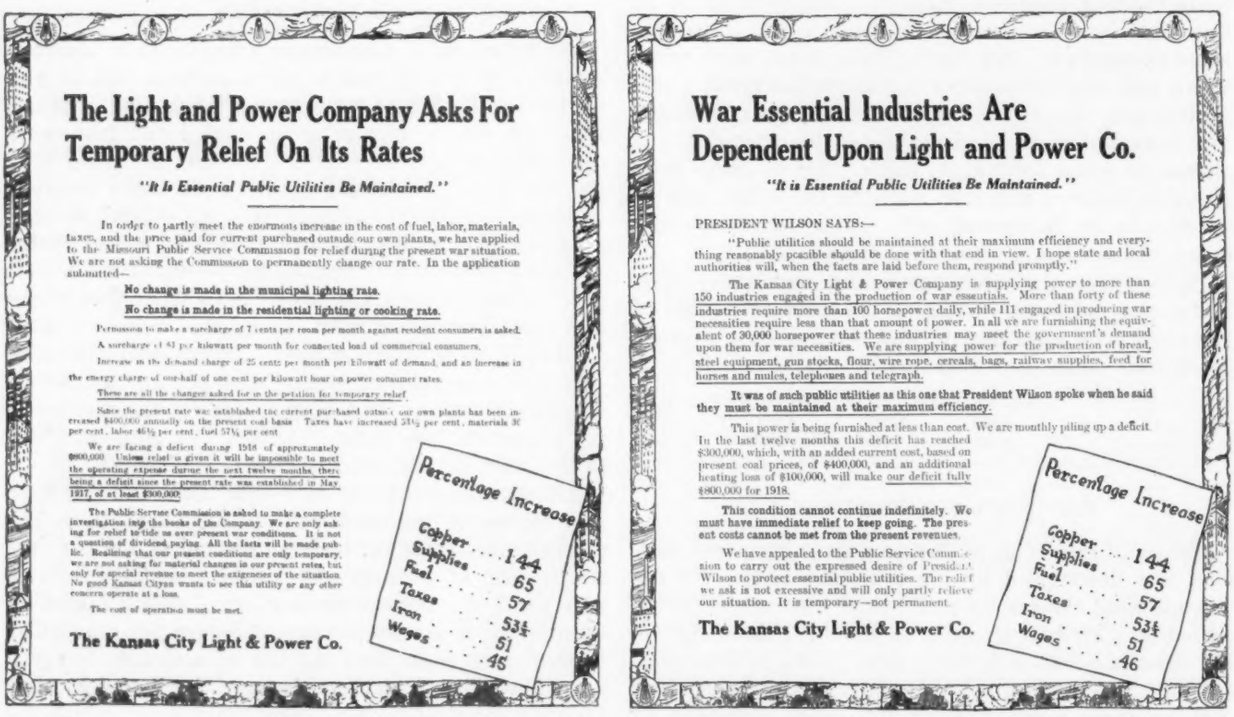
ADVERTISING TO PRECEDE ANY INCREASE IN RATES

Publicity Plan Used by Kansas City Company to Acquaint Public with Situation Which Made It Necessary to Ask for More Revenue

Even in states where rates are regulated by commissions it has been found good policy to precede applications for increased rates by publicity programs designed to set forth the company's point of view. In such a case the job of preparing the "rate-increase copy" consists briefly of planning an advertising campaign that will "sell" to the public the idea that the company must have more revenue in order to live. Therefore the medium to be used must be chosen, the topics selected concerning which the public will be addressed, and these appeals intelligently written.

How this problem was solved by A. B. Atchley, manager of publicity for the Kansas City (Mo.) Light & Power Company, is told in the following. He chose to use newspapers exclusively, but he did not use all the newspapers in town. He selected one so-called high-class paper to reach the biggest business men and one other paper to reach the great mass of the people. One was a morning and one an evening paper. He placed no advertising in one of the city's greatest papers because of its manifestly unfair criticism of the utility. The space purchased for the series of ten advertisements measured about 9 in. wide by 10 in. high for each insertion.

All of the advertisements were woven about a few fundamental ideas. These may be enumerated as follows: (1) The essential character of public utilities; (2) the increased cost of commodities entering into public utility service; (3) the inadequacy of present revenues; (4) the reasonableness of the amount of the increase asked by the company. The first advertisements (see ELECTRICAL WORLD, June 8, page 1227) told concisely why the company needed more revenue and told what it was and was not asking for. Several issues dwelt in detail on the increased cost of labor and material and the higher operating costs of utilities. Another recounted how 150 of Kansas City's industries essential to war were dependent on public utility power. Another listed by states the cities of about the same size as Kansas City where increases in rates have already been granted. Another invited investigation of its records by the engineers of the commission. Still another explained the decreased purchasing value of the dollar. A feature of each advertisement was the quoted phrase near the top of the page, "It is essential public utilities be maintained." The percentages by which common commodities like coal and copper entering into electrical production have increased were included.



The Light and Power Company Asks For Temporary Relief On Its Rates

"It Is Essential Public Utilities Be Maintained."

In order to partly meet the enormous increase in the cost of fuel, labor, materials, taxes, and the price paid for current purchased outside our own plants, we have applied to the Missouri Public Service Commission for relief during the present war situation. We are not asking the Commission to permanently change our rate. In the application submitted—

No change is made in the municipal lighting rate.

No change is made in the residential lighting or cooking rate.

Permission to make a surcharge of 7 cents per room per month against resident consumers is asked.

A surcharge of 43 per kilowatt per month for connected load of commercial consumers.

Increase in the demand charge of 25 cents per month per kilowatt of demand, and an increase in the energy charge of one-half of one cent per kilowatt hour on power consumer rates.

These are all the changes asked for in the petition for temporary relief.

Since the present rate was established the current purchased outside our own plants has been increased $400,000 annually on the present coal basis. Taxes have increased 53½ per cent., materials 30 per cent., labor 46½ per cent., fuel 57¼ per cent.

We are facing a deficit during 1918 of approximately $800,000. Unless relief is given it will be impossible to meet the operating expense during the next twelve months, there being a deficit since the present rate was established in May, 1917, of at least $300,000.

The Public Service Commission is asked to make a complete investigation into the books of the Company. We are only asking for relief in order to meet present war conditions. It is not a question of dividend paying. All the facts will be made public. Realizing that our present conditions are only temporary, we are not asking for material changes in our present rates, but only for special revenue to meet the exigencies of the situation. No good Kansas Citizen wants to see this utility or any other concern operate at a loss.

The cost of operation must be met.

The Kansas City Light & Power Co.

Percentage Increase

Copper	144
Supplies	65
Fuel	57
Taxes	53½
Iron	51
Wages	45

War Essential Industries Are Dependent Upon Light and Power Co.

"It is Essential Public Utilities Be Maintained."

PRESIDENT WILSON SAYS:—

"Public utilities should be maintained at their maximum efficiency and everything reasonably possible should be done with that end in view. I hope state and local authorities will, when the facts are laid before them, respond promptly."

The Kansas City Light & Power Company is supplying power to more than 150 industries engaged in the production of war essentials. More than forty of these industries require more than 100 horsepower daily, while 111 engaged in producing war necessities require less than that amount of power. In all we are furnishing the equivalent of 30,000 horsepower that these industries may meet the government's demand upon them for war necessities. We are supplying power for the production of bread, steel equipment, gun stocks, flour, wire rope, cereals, bags, railway supplies, feed for horses and mules, telephones and telegraph.

It was of such public utilities as this one that President Wilson spoke when he said they must be maintained at their maximum efficiency.

This power is being furnished at less than cost. We are monthly piling up a deficit. In the last twelve months this deficit has reached $300,000, which, with an added current cost, based on present coal prices, of $400,000, and an additional heating loss of $100,000, will make our deficit fully $800,000 for 1918.

This condition cannot continue indefinitely. We must have immediate relief to keep going. The present costs cannot be met from the present revenues.

We have appealed to the Public Service Commission to carry out the expressed desire of President Wilson to protect essential public utilities. The relief we ask is not excessive and will only partly relieve our situation. It is temporary—not permanent.

The Kansas City Light & Power Co.

Percentage Increase

Copper	144
Supplies	65
Fuel	57
Taxes	53½
Iron	51
Wages	46

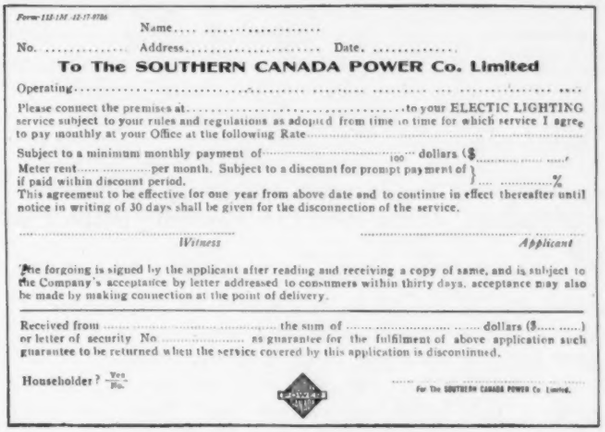
ENLIGHTENING THE PUBLIC IN ADVANCE WHEN RATE INCREASES ARE NECESSARY

CARD CONTRACT COVERING LIGHT AND POWER SERVICE

Canadian Company Uses Form Containing No Regulations, Thereby Simplifying Filing and Attracting the Customer

A simple form of card contract is being used by the Southern Canada Power Company, Ltd., Montreal, Que. The card measures 8 in. by 5 in., and on the reverse side it has the same contract except that it is in the French language, because of the large French population.

The average contract used by light and power companies is crowded with numerous regulations legally phrased and which not infrequently serve to frighten



Name.... .....

No. ..... Address..... Date. .....

To The SOUTHERN CANADA POWER Co. Limited

Operating.....

Please connect the premises at.....to your ELECTIC LIGHTING service subject to your rules and regulations as adopted from time to time for which service I agree to pay monthly at your Office at the following Rate.....

Subject to a minimum monthly payment of.....dollars ($...../100) Meter rent.....per month. Subject to a discount for prompt payment of } .... % if paid within discount period.

This agreement to be effective for one year from above date and to continue in effect thereafter until notice in writing of 30 days shall be given for the disconnection of the service.

Witness *Applicant*

The forgoing is signed by the applicant after reading and receiving a copy of same, and is subject to the Company's acceptance by letter addressed to consumers within thirty days, acceptance may also be made by making connection at the point of delivery.

Received from ..... the sum of ..... dollars ($.....) or letter of security No ..... as guarantee for the fulfilment of above application such guarantee to be returned when the service covered by this application is discontinued.

Householder? Yes. No.

For The SOUTHERN CANADA POWER Co. Limited.

CARD CONTRACT USED BY MONTREAL COMPANY

the prospective customer, especially if he be a householder. In addition, as has frequently been shown, such contracts do not lend themselves readily to convenient filing. With this Canadian company the regulations are kept on file and are available whenever required, while the card, satisfying all practical purposes, is filed with others of its kind.

The card when filed constitutes an option on the customer's business for a period of thirty days. Besides, it acts as a deposit form. A copy is retained by the customer.

IDEAS ON THE TRAINING OF ILLUMINATION SALESMEN

Individual Company Courses Recommended in Which Employees Shall Be Given Instruction in the Principles of Illumination

After outlining his ideas on the essential qualifications that lighting salesmen should have, Charles A. Luther of the People's Gas, Light & Coke Company, Chicago, speaking before a recent meeting of the Chicago Section, Illuminating Engineering Society, gave a summary of the assistance which companies can render men who are in training to sell illumination. Mr. Luther's program of training follows:

The employer can very materially help his salesmen in becoming proficient in their specializing on lighting by holding regular classes or meetings at least once a week where the men can be shown by actual experiments and demonstrations just what effects and results can be secured from the various types of units and diffusing equipments, including not only the ones they are handling but also those handled by their competitors. At these meetings everything new pertaining to illumination, whether it be in the nature of a type of unit or a description of some installation published in a house organ or trade periodical, can be discussed, and the relative merits or disadvantages can be brought out in such a logical way that they will be stamped indelibly upon the minds of the salesmen and can be brought out forcibly at the opportune moment when required to turn an order in his favor.

The employer can compile a course in illumination, covering the fundamental principles of artificial illumination, which can be divided into sections, and each section can have from ten to twenty questions covering the most important features of each section. The salesmen should be required to answer these questions, after which their answers can be checked.

A large blackboard should be used to lay out in detail various plans of stores, factories, etc., on which the men should be required to plan the lighting equipment, specifying the type of units to be used, as well as their spacing, their height above the working plane or floors, the cost of installation, the rental per month and the cost of operation after they are installed.

At one of the meetings the men can be notified that at a future meeting the manager will call on two men to hold a debate on the relative merits of their equipment and their competitors'. The rest of the men should be required to criticise any blunders or omissions that either of the men makes, and as the men should not know till the meeting night who will be called on they will naturally keep themselves primed.

COAL CHARGE BRINGS HIGHER UNIT REVENUE

Nevertheless, Central Station in New England Found that It Had to Bear Part of the Additional Burden of Coal Cost

An instance of increased unit revenue resulting from the application of a coal charge is afforded by a street railway's transactions with a central station situated on tidewater in eastern New England. The power contract between the two concerns is based upon a price of coal not exceeding on an average $4 per ton delivered at the wharf. Should the average price be in excess of $4 per ton, then the railway company pays the power company at the end of each year an amount equal to that obtained by multiplying such excess per gross ton by the number of gross tons of coal actually burned in generating electricity for the railway company. The amount of coal so burned is taken as bearing the same proportion to the total coal burned in the station as the electrical energy used by the railway company, as measured, bears to the total energy generated in the station and distribution from it. This contract was made when the price of coal was about $3.37 per ton, so that the power company was obliged to stand the loss between $3.37 and $4 per ton before any adjustment was made. For the year 1917 the cost of power to the railway company was $223,593, an increase of about $55,000 over the amount paid in the year ended June 30, 1916. The average price of coal for 1917 was $7.51 per ton against $3.65 for 1916. The average price of coal for 1917 was $7.51 per ton against $3.65 for 1916.

The unit selling price of energy to the railway by the central station at the alternating-current terminals of the railway substations was 1.77 cents for the year 1917 per kilowatt-hour, compared with a base price of 1.4 cents per kilowatt-hour made for coal at $4 per

ton. In 1917 the central station received 0.37 cent more per kilowatt-hour of alternating-current energy delivered at the substation terminals than in 1916. The total energy generated at the plant in 1916 cost 0.42 cent per kilowatt-hour for fuel and 0.84 cent in 1917, or an increase of 0.42 cent. As the cost of generation per kilowatt-hour delivered at the substations as alternating-current energy exceeds the cost of production per kilowatt-hour at the plant itself on account of the reduced number of kilowatt-hours delivered at the substations compared with the energy produced at the main plant, it is apparent that the additional price paid by the railway in this case did not fully compensate for the increased cost of coal at the main plant. The central-station company bore part of the added burden, and in support of this practice it is contended that if a company shares a part of the burden of increased costs it will find its applications for rate advances more favorably regarded by the public and by the public utility commissioners having jurisdiction over it in rate matters.

SPEEDING UP COLLECTIONS OF CUSTOMERS' ACCOUNTS

Methods and Policies Used by More than Thirty Indiana Companies to Shorten Interval Between Meter Reading and Payment of Bills

BY O. M. BOOHER
Chairman Commercial Section Indiana Electric Light Association

It appears to the writer that the question of collections looms large, particularly at this time, when every dollar must be worked and worked to the limit. The usual custom of having the local central station serve its community in the capacity of a bank, without proper banking rules and regulations, is poor business, even when money is easy. The tightening up of money naturally should lead the central station to think of means to hasten collections. The practice of time payments on merchandise and miscellaneous sales accounts should be either entirely eliminated or greatly reduced unless a fair rate of interest is collected or unless the sales profits are amply sufficient to warrant time payments.

It is hard to avoid the conclusion that the time has arrived when the problem of collections should be vested in a department separate and distinct from all other departments. Especially is this true with the larger properties. There should be employed a department with a competent head who has been trained thoroughly in the matters of aggressive and effective collection systems.

RECONNECTION CHARGE SHOULD BE ENFORCED

All companies should establish and enforce without discrimination certain penalties for non-payment. In extreme cases, where disconnections are necessary, a charge for reconnection is not out of place if the "chronics" are to be eliminated. We have enforced in Kokomo the reconnection charge of $1 and find that it adds materially to our collections as a whole, helping to reduce our non-collectibles to less than 0.5 per cent. We do not find much adverse public comment caused by this practice.

The public is learning very rapidly how to adapt itself to new conditions without complaining, and the utility should grasp the opportunity so far as is possible to ask of the public all things reasonable and necessary, especially those things which the public will not complain about and which are of much help to the utility.

Another feasible plan which is working out successfully, especially with the larger companies, is the establishment of authorized agencies in each small community center where all bills save those in dispute or in arrears may be paid. Such a system adds much to the convenience of the customer and speeds up collections considerably. At the same time it creates public good will.

REPLIES TO QUESTIONS ASKED OF FORTY-EIGHT ELECTRIC COMPANIES

	Number Answering	Yes	No	Average of Answers
Do you allow cash discount	37	28	9	....
Do you send out delinquent notices	36	30	6	....
Do you discount for non-payment after a certain date	36	34	2	....
Do you charge for reconnection	38	17	21	....
Per cent. of bills collected during discount period	31	..	..	78.5
Per cent receiving delinquent notices	30	..	..	11.2
Per cent of total monthly receipts considered non-collectible	24	..	..	0.87

The question of collections is closely affiliated with public policy. Labor is scarce and its scarcity is increasing, consequently labor is growing much more independent. A man can be loyal to his company or disloyal as he chooses. He can get a job just as good, or maybe a little better, somewhere else. Therefore great care should be exercised in the selection of a man to place in charge of collections, so as to be sure that the company's interest will be carefully looked after. The customer should not be antagonized or insulted because he is a little late paying his bills. In other words, proper discretion should be exercised, and this will not be done unless a man of acquaintance and one who is in touch with the public pulse be employed.

HOW THIRTY INDIANA COMPANIES DO IT

In order to summarize the collection practice of a number of companies the writer sent letters to forty-eight members of the Indiana Electric Light Association. The replies received are reviewed in the table herewith. These replies show that a majority of companies favor allowing cash discount, sending out delinquent notices and disconnecting promptly for non-payment. Opinion seems to be about equally divided for and against a charge for reconnection. The replies also show that 78.5 per cent of the customers take advantage of cash discounts and 11.2 per cent wait to reecive delinquent notices. The average of accounts considered non-collectible amounts to the surprisingly high figure of 0.87 per cent.

The letters also brought out that in thirty-one companies the collections are looked after as follows: Two companies by manager of collections, five companies by chief clerk, eight companies by cashier, two companies by auditor, seven companies by office force, six companies by general manager, and one company by treasurer. In most cases the same individual looks after collections of accounts for merchandise, motors and signs as well as customers' monthly accounts for energy consumed.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Empirical Equations for Speed and Torque Curves of the Series Motor.—A. S. LANGSDORF.—While it is generally most convenient to represent by graphs the relations between speed, torque and current of series motors, occasionally it may be desirable to summarize these relations in the form of equations. To illustrate the method generally applicable in such a problem the author worked out the equations of a Westinghouse railway motor from curves published by the manufacturer.—*Washington University Studies*, July, 1918.

Standardized Motors for the Steel Industry.—W. T. SNYDER.—Steel-plant operators have two alternatives in the choice of electric drive: (a) To adopt a certain motor and get the benefits of standardization, as far as possible, or (b) to buy motors in open competition based on price and reliability and be content with a conglomeration of motors of different makes. The standardization committee of the Association of Iron and Steel Electrical Engineers is now studying the advisability and possibility of a joint committee of engineers, representing makers and users, designing a line of standard motors which all manufacturers would be asked to build.—*Proceedings Association of Iron and Steel Electric Engineers*, March, 1918.

Generation, Transmission and Distribution

The Essentials of Transformer Practice—XII.—E. G. REED.—Deals with the effect of load factor on operating cost and fixed charge, yearly cost of transformer losses, cost of transformer exciting current, cost of transformer regulation, and total cost of operating a transformer.—*Electric Journal*, July, 1918.

Fuel Oil as a Substitute for Coal.—This article deals with oil available for fuel purposes, care required to prevent waste of oil, comparative maintenance expenses with oil and coal, selection of type of burners, oil pressure and temperature, importance of air regulation, boiler furnace for oil fuel, oil-fuel shortage, automatic regulation of fire, fuel-oil demand for ships, interconnection of hydroelectric plants, and available deposits of oil shale.—*Journal A. S. M. E.*, July, 1918.

Ground Connections for Electrical Systems.—O. S. PETERS.—Information available up to this time has been supplemented by new experimental data to form a comprehensive report on the subject of "grounds." The matter is taken up in the following order: (1) Resistance of ground connections; (2) their uses and service conditions; (3) different forms of ground connections and the electrical characteristics of each; (4) mechanical construction; (5) inspection and testing; (6) fire hazard and interference with service; (7) costs; (8) bases for specifications, and (9) field measurements of the resistance of ground connections. It has been found that the contact resistance between clean metal and earth is negligibly small when the earth is properly tamped and is moist. Rusting, contrary to the general belief, does not appreciably affect the contact resistance of an electrode in the ground, but care should be taken to eliminate grease, paint or any non-conducting scale which may seriously impede the flow of current. Salt improves the conductance of the soil and it is of particular importance that the ground remain moist. The author lays considerable stress on the idea that grounds should not be specified by mechanical construction but should meet certain electrical tests. In particular, the ground resistance should be such that when a certain heavy current flows through it the potential rise at the copper connection above the surface should not be more than 150 volts above the earth. This heavy current is fixed at the rating of the nearest circuit breaker which will operate to disconnect the equipment or circuit concerned from the source of the dangerous voltage. Thus a ground is satisfactory when human life, as well as low-tension apparatus, is safe in its vicinity. Water pipes are especially recommended for ground circuits, but it is suggested that gas mains should be used sparingly on account of the danger of explosions. Periodic tests should be made to insure low resistance. —*Bulletin No. 108, Bureau of Standards*, June 20, 1918.

Installations, Systems and Appliances

Electrical Labor-Saving Devices in Coal Mining.—GRAHAM BRIGHT.—Every effort must be made to speed up coal production, even with a decreased supply of workmen. It is evident, then, that labor-saving devices must be used to the utmost in the coal-mining operations. The writer prefers central-station energy for mine service on account of the fact that more reliable service may be obtained than from local plants. The pumping of water is best done electrically, and motors without starting devices may be used. Ventilating fan units are most reliable and efficient when electrically operated. A considerable saving in drivers may be made if locomotives instead of mule teams are used for gathering, and for main haulage there is no comparison between animal and electric traction. Direct-current motors with flywheels serve admirably for hoisting, and the greatest economy (especially in man power) results from the use of cutting and loading machines. Especially from the superintendent's point of view telephones are useful as time savers.—*Coal Age*, July 10, 1918.

Opportunities for Central-Station Power in Oil Fields.—L. E. MOHRHARDT.—The author points out the fact that motor drive is especially applicable to the pumping of both shallow and deep wells. Alternating-current supply is preferred on account of the distance of the oil fields from central stations. Alternating-

current motors should be of the two-speed type, so that one speed may be used for pumping and another for operations such as pulling the rods and cleaning. Electric drive may also be used for drilling and for maintaining the proper head in pipe lines. This load is especially desirable since the operation is practically continuous for twenty-four hours per day.—*Electrical Review*, July 6, 1918.

Electricity in Coal Mining.—FRANK HUSKINSON.—A general discussion is given concerning the application of electricity to coal-mining operations. The writer points out the fact that central-station service is far more desirable for coal-mining operations than the use of special plants located at the mines, for the reason that these isolated plants are commonly not well cared for. He recommends the use of alternating-current supply, as far as possible, on account of the greater flexibilities of this system for various voltages in use. He also states that although direct-current is constantly used for mine locomotives, the three-phase induction motor may be well adapted to this service.—*Electrical Review*, July 6, 1918.

A Rocking Electric Brass Furnace.—H. W. GILLETT and A. E. RHOADS.—On account of the increasing difficulty of obtaining crucible materials and on account of the deterioration of the quality, the authors suggest that the use of crucibles in brass making should be superseded by electric furnaecs. One item of especial importance in the operation of brass furnaces is the fact that the zinc boils at comparatively low temperature. For this reason fuel-fired furnaces of the reverberatory type may only be applied to brass at the expense of a high loss of zinc. The same consideration prevents the use of the direct-arc type of electric furnace such as the Heroult furnace for this purpose. The authors review the various types of furnaces which have been developed for brass melting, giving their disadvantages and the reasons why they are not commercially more practical. In a study of electric brass melting during the past five years, the Bureau of Mines has tried out a rocking-type furnace which may perhaps help to fill this gap. In the ordinary indirect-arc type of furnace the heat is applied above the melt, and as hot metal is lighter than colder metal there is little circulation in the bath. If the rate of heat input is at all rapid, as is necessary for thermal efficiency, heat conduction from the top of the melt downward does not keep pace with the heat supply. Before the melt as a whole reaches the proper pouring temperature the surface is much superheated. In the case of an alloy high in zinc the surface will reach the boiling point of the zinc in that particular alloy while the bottom is scarcely melted. The obvious way to overcome this difficulty is to stir the melt so vigorously as to make the temperature practically uniform and thus prevent the superheating of the surface. Instead of rotating the furnace through a complete revolution which would involve difficulties in keeping the metal out of the joint between the door and the door opening and in making bus contacts to the electrodes, it appears simpler to rock the furnace back and forth so that the molten charge just fails to reach the door at either end of the rocking angle. In the development of a furnace of this type, the Detroit Edison Company had long been interested and offered to co-operate by constructing a rocking furnace for commercial test. Sketches of the furnace design were given the Detroit Edison Company, which refined the design, made the working drawings, constructed and erected the furnace. The authors present a considerable amount of data, such as the energy required per ton of metal poured, the electrode consumption and total cost of operating the furnace. Accurate temperature control is very easy in the rocking furnace, since the walls are no hotter than the metals and there is no heating up of the sides from hotter roof and walls. After cutting off the arc the temperature falls very slowly, about 2 or 3 deg. C. per minute. By running the arc a minute or so every ten or fifteen minutes, the charge can be held at pouring temperature for an indefinite period. Where automatic electrode control is used one man can probably attend to two furnaces. The output per man-hour was greater from the rocking furnace than from the coke fires, and the working conditions are much less severe and more healthful with electric furnaces than is the case with coke fires. A more detailed account of the test of the rocking furnace will soon be published in bulletin 171 of the Bureau of Mines.—*Chemical and Metallurgical Engineering*, June 1, 1918.

Electrophysics and Magnetism

Some Characteristics of the Marvin Pyrheliometer.—PAUL D. FOOTE.—For the first time, it is believed, a pyrheliometer has been calibrated by two methods, the usual electrical method and a radiometric method. The calibrations by the two methods agreed within limits of experimental error. A lag, part of which is due to the galvanometer of the bridge, has been found to exist, and with a silver disk No. 3 it was experimentally shown to be less than two seconds. Both theoretically and experimentally it was shown that the effect of this lag is negligible after five to ten seconds. The cooling and heating of the receiver follows Newton's law of cooling. In order to eliminate completely errors due to a lag effect, readings should be made at ten seconds and sixty seconds following the beginning of a heating or cooling. The factor for converting readings of temperature or resistance change over this fifty-second interval to corresponding changes over a complete sixty-second period is 1.217. This factor is the same for both electrical and radiometric heating and was determined with an accuracy of 0.1 per cent. The Marvin pyrheliometer was found to give 2 per cent lower values of the solar radiation than the Smithsonian pyrheliometer. This difference is within the errors of observation of the present calibration.—*Scientific Paper No. 323*, Bureau of Standards, June 28, 1918.

Grating Space of Calcite and X-Ray Spectrum of Gallium.—ARTHUR H. COMPTON.—It is claimed by the author that the wave lengths of characteristic X-rays from gallium given by Uhler and Cooksey require revision because of error in their determination of the grating space of calcite.—*Physical Review*, June, 1918.

X-Ray Emissions as Function of Applied Voltage.—It is shown how the emission depends upon the voltage from a consideration of well-established physical facts. —*Physical Review*, June, 1918.

Formation of Negatively Electrified Raindrops.—The author shows how negatively electrified drops may be blown from positively electrified drops by a wind giving off positive charges to water.—*Physical Review*, June, 1918.

Electrochemistry and Batteries

Electric Storage Batteries—IV.— Attention is given to the characteristics of the Edison storage battery with special reference to care and upkeep. There also appears a general discussion on the application of storage batteries to central-station service, in which some methods of voltage control are given.—*Power Plant Engineering*, July 15, 1918.

Units, Measurements and Instruments

Boiler-Room Instruments.—Instruments which are useful and desirable in the boiler room as aids in saving coal are named, and the essential ones are indicated. Among other subjects considered are controllable losses in boiler operation, results which should be known promptly on relation of steam flow and air flow to coal feed, advantages of recording meters, and what a CO_2 recorder shows.—*Journal of American Society of Mechanical Engineers*, July, 1918.

Magnetic Observations.—Compilation of a series of highly successful magnetic observations which were undertaken by the Carnegie department of industrial magnetism and the United States Coast and Geodetic Survey.—*Science*, July 5, 1918.

The Engineering Evolution of Electrical Apparatus—XXX.—CHARLES R. RIKER.—A history of indicating meters, dealing with D'Arsonval instruments, hot-wire instruments, electrostatic voltmeters, electrodynamometer instruments, etc.—*Electric Journal*, July, 1918.

Telegraphy, Telephony and Signals

Motor Vehicles in Telephone Work.—A general discussion is given concerning the applications of motor trucks to line construction. It is pointed out that they may be used for moving large quantities of material and for the distribution of supplies from storerooms to the men on the job. These trucks may be equipped for pulling wires in the case of overhead construction and also for drawing in cables in case of underground construction. The workmen are moved to and from a job with much less loss of time than formerly, and work may be undertaken at a much greater radius from headquarters than would be possible without the services of motor vehicles. It is pointed out that the White company has designed trucks especially for service in connection with line work.—*Telephony*, July 20, 1918.

Theoretical Calibration of Condenser Transmitter.—I. B. CRANDALL.—A study is made of the mechanics of the condenser transmitter with reference to air damping and elasticity, from which may be constructed a theoretical calibration curve.—*Physical Review*, June, 1918.

Miscellaneous

The Structure of Metals.—The penetrating power of the X-ray tube has been greatly increased as developed by Mr. Coolidge, who devised a cathode of a spiral of tungsten surrounded by a sleeve of molybdenum. For example, the rays can penetrate 4 in. (10.2 cm.) of hard steel if a sufficiently high voltage is used. This apparatus is very useful in examining welds for air holes and flaws, but great care must be exercised to protect the operator from "burning." The process of examining metals is a photographic one, and it is said that a hole 1/50 in. (0.5 mm.) in depth can be detected in 2 in. (5.1 cm.) of hard-steel casting. Also that 1/1000 in. (0.025 mm.) variation in thin mica insulation can be detected.—London *Times Engineering Supplement*, June, 1918.

Electrical Power for Oil Fields.—Attention is called to the advantages of employing electrical machinery in oil fields in place of the notoriously inefficient steam plants commonly used in most cases and to the indiscriminate selection of gas and oil engines for power purposes. Figures bearing on the cost of installing and working electric motors are given, and it is pointed out that British electrical manufacturers will find a large market for their products if they will carefully study the requirements of the petroleum industry.—London *Times Engineering Supplement*, June, 1918.

Electric Arc Welding.—E. WANAMAKER.—Great economy has been effected in the Rock Island Railway system by means of electric welding devices which perform a variety of services, such as cutting plates and holes, the welding together of sheets, welding of tubes to the back flue sheets and repairing holes in fire boxes of locomotives. The "metal electrode" method of welding is employed, using a soft steel wire or other metal as the negative. Direct-current energy at 20 volts is furnished by a number of portable motor-generator sets which are applicable to the considerable varieties of work. The detailed results of six months' operation are given, based on the expenditure of $40,000 for electrical welding outfits. It is shown that 85.7 per cent of the cost of welding by older methods was saved by the new system and that the electrical system shows a saving of 28.5 per cent over the gas method. On the basis of results obtained thus far, the author calculates the rate of saving to be $200,000 per year. Of this, $136,000 is a direct saving in the performance of the work and $64,000 represents increased service of engines due to shorter time for repairs. By extending the use of the electric welding operation over the whole Rock Island system the author estimates a possible yearly saving of $1,000,000.—*Journal Cleveland Engineering Society*, May, 1918.

German Trade Methods in Spain.—It is shown that German trade with Spain in engineering equipment, while not large, grew rapidly in antebellum years, on account of the elaborate and systematic propaganda of agents representing German houses. The newer group of technical men in Spain were thus growing up to believe that German apparatus was far superior to other makes.—London *Electrical Review*, July 5, 1918.

Internal-Combustion Engine Lubrication and Lubricants.—P. H. CONRADSON.—The selection of the proper grade of oil for each class of service depends upon a number of factors, such as the type and condition of the machine, the lubricating system, the method of applying the lubricant and the method of cooling, as well as climatic conditions. One of the essential points in the selection of lubricants is that they should have sufficient body not only to make a proper seal at the start, when the clearance between the piston rings and cylinders may be great, but also, when the engine becomes highly heated, to prevent the gaseous vapors from leaking past the piston rings and condensing in the oil in the system, thereby reducing the efficiency of the lubricant.—Extracted from paper presented before the American Society for Testing Materials, June 25-28, 1918.

Improved Power Factor Is Urgent

To the Editor of ELECTRICAL WORLD:

Sir: Central stations and industrial plants of the country are struggling to keep pace with the tremendous demands made upon them for electrical energy. Conservation of our resources demands that present equipment be made to serve to the limit of its capacity. To do this, equipment having to do with alternating current should operate at the highest possible power factor. A poor or low power factor carries a pure economic loss and, in general, goes hand in hand with poor efficiency. It therefore follows that if the power factor of the alternating-current installations can be improved, there will result greater output from this equipment, relieving the burden on the electrical manufacturers, labor, transportation—ultimately fuel.

Power factor might be defined as the ratio between useful work and the apparent work of any piece of alternating-current apparatus. Inasmuch as the apparent work limits the capacity of this apparatus, the useful work should be made to approach the apparent work as closely as possible. A concrete illustration may better explain. A central station was asked to supply a manufacturer with 100 kw. of power. A power feeder passing his premises was fully loaded with apparent amperes, but not with useful amperes, due to its supplying entirely induction motor load. However, this manufacturer agreed to install apparatus—a synchronous motor—which would cause the useful amperes on the feeder to approach more closely the apparent amperes. This was done and the load put on without any noticeable increase in apparent amperes, yet this same apparatus was delivering 100 kw. more of useful power. Consider what was saved: A new feeder from the manufacturer's premises to the substation, substation equipment, feeder capacity from substation to generating plant and probably 133 kva. in generator capacity. Consider further what this ultimately means in labor, material, transportation and fuel.

A further illustration of a manufacturer purchasing energy for the operation of 600 hp. of induction motors, varying in size from 2 to 100 hp., might be noted. Transformers and necessary apparatus were installed of estimated capacity to carry the load, as had been shown by steam engine indicator cards. Electrical operation with motor drive was started. Upon inspection it was found that transformers and portions of the wiring were apparently overloaded. A careful investigation of the motor installation was then made. As a result, when carefully rearranged, over 100 hp. in motors was on the floor available for other uses, and also approximately 1500 kw.-hr. per month was saved. Also the apparent amperes were reduced or brought more closely to the useful amperes, so that the transformers and wiring were working under conditions free from danger of burnout. This improvement of power factor meant a real economic gain.

Readers' Views and Comments

The important point to the engineer in charge of a plant operated by alternating-current equipment is that if the load imposed has a low power factor this may result in an overload on supply lines, local transformers, generating equipment, etc., with a consequent low voltage and a reduction in plant output. This condition subjects the equipment to the danger of burn-outs, which are to-day more serious than ever, as the time involved in making repairs is greater because of the shortage of spare parts as well as the shortage of men to do repair work. A shutdown due to a burn-out to-day is likely to result in considerable loss in plant production. Under present conditions this should be avoided, and may be avoided in many cases by a careful engineering study of power-factor conditions. Never before in our history has the position of plant engineer been vested with such important responsibility.

The importance of power factor is felt more and more by engineers, but there is still need for more organized co-operative effort toward the general betterment of power-factor condition in alternating-current installations.

G. E. MILLER.

Cleveland Electric Illuminating Company, Cleveland, Ohio.

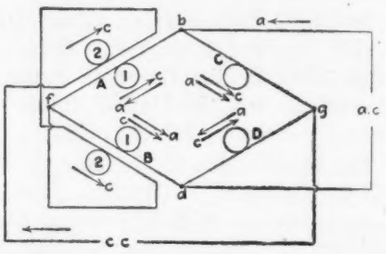
The Precise Measurement of Alternating Currents

To the Editor of ELECTRICAL WORLD:

Sir: As pointed out by C. O. Gibbon in his article on the "Precise Measurement of Alternating Currents" (ELECTRICAL WORLD, May 11, 1918, page 979), the values of alternating currents and continuous currents are the same, and his instrument is limited to this condition. By using the *b* and *d* terminals for the alternating currents, however, the two field or stationary coils (1) can be made for heavy currents, while the moving coils can be made for lighter currents. Two auxiliary field coils (2) can then be used to reinforce the field for the continuous-current element, these auxiliary coils being outside of the bridge circuit.

To adjust the placing of the extra field coils, the whole instrument is calibrated on constant current, two different sources being used and both easily measured. For example, moving coils on 0.1 amp., one set of field coils (1) on 99.9 amp. and the other set (2) on 0.1 amp., a current of 100 amp. is then sent through the bridge from *b* to *d*, this current dividing into 99.9 amp. through the field coils and 0.1 amp. through the moving coil. A current of 0.1 amp. is then sent through the bridge by way of the auxiliary field coils and the points *f* and *g* of the bridge. This current is from a separate battery. With both currents flowing—that is, 100 amp. from one battery and 0.1 amp. from another—the auxiliary coils are moved laterally until the instrument reads zero. The instrument is now ready for alternating current use as originally designed and 100 amp. alternating current will be balanced by 0.1 amp. continuous current.

To have 100 amp. divide in the ratio of 99.9/0.1 for alternating currents, it is necessary that the resistances of 99.9/0.1 of the bridge arms and the inductances shall be in the inverse ratio. To calibrate the bridge so that the fixed coil and stationary coil have the proper ratio, use alternating current and a telephone in the well-known bridge method for measuring inductances. This can be done after the instrument is built by adding inductance and resistance to either arm of the bridge as needed.



New York City. T. W. VARLEY.

To the Editor of ELECTRICAL WORLD:

Sir: So far as I can see, the use of the auxiliary field coils forms an excellent means for extending the range of the instrument. Such an instrument, however, would require very exact adjustment before leaving the laboratory. Assuming a ratio of 10:1, the following conditions must be satisfied: $R_a = R_b$; $R_c = R_d$. The alternating current divides in the ratio of 10:1, and the currents through the two paths *bfd* and *bgd* must be in phase. Hence the following relations must exist: $R_c = 10R_a$; $R_d = 10R_b$; $X_c = 10X_a$; $X_d = 10X_b$. By means of calibrated variable inductances and resistances inserted in the arms *bg* and *dg* and suitable switches for varying the number of turns in the auxiliary field, a multiple-range instrument of very high precision may be obtained. Since the coils in the arms *B* and *D* are used only as balancing inductances it is unnecessary to place an anxiliary field on the arm *B* except to neutralize the effect of mutual inductance between the main and auxiliary field in the arm *A*.

It is my intention to bring the single-element, differential dynamometer to a much higher degree of precision than that attained in its first crude form. I therefore greatly appreciate Mr. Varley's suggestions.

CHARLES O. GIBBON.

Millville, N. J.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

INSTITUTE DIRECTORS BEGIN THE NEW YEAR

First Session for the Administrative Year of 1918-19—President Adams Announces Appointment of the Committees

The first meeting of the board of directors of the American Institute of Electrical Engineers for the administrative year beginning on Aug. 1 was held at Institute headquarters, New York, on Aug. 13.

There were present President C. A. Adams of Cambridge, Mass.; Vice-presidents William B. Jackson of Chicago, F. B. Jewett of New York and John H. Taylor of Schenectady; Managers N. A. Carle of Newark, N. J., Charles Robbins, Wilfred Sykes and Frank E. Newbury of Pittsburgh, Walter A. Hall of Lynn, Mass., William A. Del Mar and Walter I. Slichter of New York, and G. Faccioli of Pittsfield, Mass.; Treasurer George A. Hamilton of Elizabeth, N. J., and Secretary F. L. Hutchinson of New York.

President Adams announced the appointment of the committees for the administrative year. The chairmen of the committees appointed are as follows:

Finance—N. A. Carle, Newark, N. J.
Meetings and Papers—W. I. Slichter, New York.
Editing—Henry H. Norris, New York.
Safety Codes—Farley Osgood, Newark, N. J.
Board of Examiners—F. L. Rhodes, New York.
Sections—W. A. Hall, Lynn, Mass.
Student Branches—C. Francis Harding, Lafayette, Ind.
Membership—H. A. Pratt, New York.
Public Policy—Calvert Townley, New York.
Headquarters—N. A. Carle, Newark, N. J.
Electrical Engineering Service—William A. Del Mar, New York.
Code of Principles of Professional Conduct—George F. Sever, Washington, D. C.
Standards—L. T. Robinson, Schenectady, N. Y.
Power Stations—Philip Torchio, New York.
Transmission and Distribution—L. E. Imlay, Niagara Falls, N. Y.
Traction and Transportation—C. F. Uebelacker, New York.
Industrial and Domestic Power—A. G. Pierce, Pittsburgh, Pa.
Lighting and Illumination—C. E. Clewell, Philadelphia, Pa.
Economics of Electric Service—W. B. Jackson, Chicago, Ill.
Protective Devices—D. W. Roper, Chicago, Ill.
Electrochemistry and Electrometallurgy—Carl Hering, Philadelphia, Pa.
Electrophysics—F. W. Peek, Jr., Pittsfield, Mass.
Telegraphy and Telephony—Donald McNicol, New York.
Marine—H. A. Hornor, Philadelphia, Pa.
Use of Electricity in Mines—K. A. Pauly, Schenectady, N. Y.
Electrical Machinery—Alexander M. Gray, Ithaca, N. Y.
Instruments and Measurements—S. G. Rhodes, New York.
Iron and Steel Industry—Eugene Friedlaender, Braddock, Pa.
Educational—V. Karapetoff, Ithaca, N. Y.

In accordance with the by-laws of the Edison medal committee, the board elected from its own membership Charles Robbins, C. E. Skinner and Walter I. Slichter to serve on the committee for the term of two years. F. B. Jewett, John B. Taylor and Harold Pender were elected by the board to serve on the committee for one year ending July 31, 1919, to fill the unexpired terms of three retiring members of the board of directors.

Local honorary secretaries were reappointed for the two years ending July 31, 1920, as follows: Robert Julian Scott, New Zealand; T. P. Strickland, New South Wales; W. G. T. Goodman, South Australia; James S. Fitzmaurice, West Australia; L. A. Herdt, Province of Quebec; Henry Graftio, Russia; A. S. Garfield, France; Harry P. Gibbs, India; J. W. Kirkland, South Africa.

Upon the recommendation of the board of examiners, thirty-two students were ordered enrolled, 129 applicants were elected to the grade of associate, five applicants were re-elected to the grade of associate, fifteen applicants were elected to the grade of member, two applicants were transferred to the grade of fellow, and ten applicants were transferred to the grade of member.

WAR SERVICE ACTION BY THE MANUFACTURERS

General Committee Urges Thorough Co-ordination of Effort in the Interest of Maximum Service by the Whole Industry

A letter sent by W. W. Nichols, secretary of the General War Service Committee of the Electrical Manufacturing Industry, to the chairmen of the group committees calls attention to the following action taken at its meeting on Aug. 15 by the general committee:

To insure proper coördination of effort it was:

Resolved, (1) that constructive programs developed by group war service committees for conservation be subject to the approval of the General War Service Committee; (2) that future conferences of group war service committees with the Priorities Division or the Conservation Section of the War Industries Board be first either approved by or arranged by the General War Service Committee.

"The General Committee," Mr. Nichols writes, "is energetically collaborating with both the Priorities Division and the Conservation Section in the development of plans applicable to the industry as a whole, and it is important at this critical stage to avoid uncoördinated action anywhere within our organization. Your general committee does not wish in the slighest degree to hinder the development of any plan which will of service to your particular group. It only requests that, before attempting to put into effect such a plan, it first be submitted to the consideration of the general committee in order that our entire industry may render maximum service to the government."

CONSERVATION PROGRAM FOR THE SUPPLY MANUFACTURERS

A. W. Berresford Asks Group War Service Committees to Take Immediate Action for Comprehensive Report on Possibilities

A. W. Berresford, chairman of the War Service Committee of the Manufacturers of Electrical Supplies, has written to the chairmen of the various group committees in the electrical supply industry asking immediate action on a program for conservation to meet the views of the War Industries Board.

In urging that immediate and careful attention be given to this important subject, Mr. Berresford says that the group committees should not overlook the possibilities for ultimate good to the industry in following out the policy laid down by the Priorities Division of the War Industries Board. It has been stated that the manufacturer who did not take advantage of the present plans for conservation, and the relation of the War Industries Board thereto, to clear his lines by coöperation with his competitors under the instructions of the board, was missing an opportunity that could hardly present itself in normal times and which would be of exceeding value in the world-wide competition following the war.

"Nothing must be done in private interest, but much that is done now in the public interest must be of private value ultimately," Mr. Berresford says. "The dates set are reasonable in view of the public need and have already been advanced beyond what was originally contemplated. They should be met or anticipated."

The letter of Mr. Berresford reviews the conferences at Washington with the representatives of the War Industries Board in the effort to establish some means of insuring material supply for electrical manufacturers, the nature of whose business requires manufacture for stock. Mr. Berresford continues:

The final agreement reached was as follows, but was based entirely on an agreement to immediately develop a constructive program for conservation in coöperation with the Conservation Division:

1. Automatic inclusion in Class B2 will be approved only when all products have been brought to the basis of what is absolutely essential during the period of the war.
2. Favorable consideration will be given to extending automatic B2 rating to include manufacturers of essential supplies, a list of which is to be submitted by the manufacturers for approval.
3. Individual manufacturers will be given individual plant rating where justified by the information filed in report forms PC 20 and 21. (The assumption is that these will not be so favorable as B2.)

It is immediately obvious that there can be no delay in starting the work. It seems equally obvious that it can only be done through the group committees.

Your committee desires to be able to place before the Conservation Division not later than Sept. 21 a comprehensive and, so far as possible, accurate statement of the possibilities in each group of the industry, together with the pledge of each group that it will actively promote the plan which it suggests. This would require the holding of group meetings as soon as they can be organized, but certainly so that reports may be received by your committee not later than Sept. 14.

The following possibilities should be carefully considered and report and recommendation made thereon in as definite form as practicable:

1. Reduction in stock of raw material.
2. Reduction in stock of finished products.
3. Elimination of sizes, types and styles of apparatus and results possible thereby.
4. Elimination of wasteful competition.
5. Elimination of sales campaigns.
6. Reduction of consumption by elimination of replacements of material which, while possibly less desirable than present product, or even obsolete, may well survive the period of the war.

The desire and intent of the Priorities Division is that only such material shall be used as is necessary to be used. In the words of Judge Parker, it is not a question of applying a remedy which will in the end effect a cure, but of applying the surgeon's knife now.

In the opinion of your committee, however, it is vital that the course suggested be taken and it is every man's duty to coöperate to the exclusion of his personal interest.

Will you therefore make immediate arrangements for the meeting of your group, notifying the writer of the time and place thereof, and, as soon thereafter as possible, the date at which you will make report?

PORTLAND (ORE.) COMPANY ASKS FOR HIGHER RATES

Petition to Commission Says that Operating Expenses for Year 1918 Will Be 63.9 per Cent Greater than in 1916

The Portland (Ore.) Railway, Light & Power Company has filed with the Oregon Public Service Commission an application for an advance in light and power rates in the city of Portland and Willamette divisions of the company over the rates fixed by the commission in May, 1917. At that time the commission ordered the company to discontinue the commercial power rates then in force.

These rates were placed in two divisions. The first provided that all electrical energy used by the consumers under 73 kw.-hr. a month be charged at a primary rate of 5 cents for the first 500 kw.-hr., 4 cents for the next 500 kw.-hr., 3 cents for the next 4000 kw.-hr. and 2 cents a kilowatt-hour for all in excess of 5000 kw.-hr. The secondary rate was made for users of a great amount of energy and was lower than the primary rates.

In its petition the company states that these rates were based upon operating conditions prevailing during the year and a half ended Dec. 31, 1916, and that the commission assumed that the conditions then existing would be fairly indicative of those to be encountered in the near future.

While the aggregate revenue from the electric properties for 1917 was 4.9 per cent greater than for 1916, the revenue per kilowatt-hour for 1917 was less than for 1916 by 12 per cent, and while the 1918 revenue will be 16.1 per cent greater than for 1916 the 1918 revenue per kilowatt-hour will be 22 per cent less than for 1916.

Operating expenses of the electric properties, including taxes, depreciation and fixed charges, have increased so that while revenues under present rates for 1918 will be 16.1 per cent greater than for 1916, operating expenses will be 63.9 per cent higher and operating expenses for each kilowatt-hour produced and utilized for 1918 will be greater by 10 per cent than in 1916. Operating expenses in 1918 will be increased because of the necessity of more continued operation of the steam-power plants, due to heavy loads on the system as a result of increased activities in war industries and low water conditions.

NATIONAL CONTROL OF THE POWER RESOURCES

Terms of Bill to Give President the Authority to Build or Use Stations or Energy in the Paramount National Interest

T. W. Sims, chairman of the House committee on interstate and foreign commerce, has introduced in the House of Representatives a bill to provide further for the national security and defense and for the more effective prosecution of the war by furnishing means for the better utilization of the existing sources of electrical and mechanical power and for the development of new sources of such power. The bill provides the sum of $150,000 for administrative expenses and provides the sum of $200,000,000 for the purchase and building of power plants.

The proposed legislation is to be known as the emergency power act. It is not to be confused with the water-power bill now pending in the House of Representatives and will not be considered in connection with that bill, which is all ready on the floor of the House, while the emergency power act has but just been referred to the committee. Hearings on the emergency power act were begun before the House interstate and foreign commerce committee on Aug. 23.

In making the bill public, Representative Sims issued a statement in part as follows:

We are facing a power shortage which is and for some time past has been acute and is hampering our progress on war production. So this measure authorizes the President to erect power stations near the coal mines and at other points where he may deem them necessary, or to extend financial aid to persons or corporations about to do so, and therefore desiring to secure results of tremendous, immediate and inestimable value to America. It is considered necessary by representatives of the administration, by representatives of the great power companies and by economists who attacked the problem from various viewpoints, and is indorsed by all of them.

This bill must not be misunderstood as in any wise taking the place of the water-power bill now before the House. That is in its nature a peace-time measure, and the provisions of the two do not conflict. The plans are to confer upon the President all necessary power to deal with the urgent power situation properly and effectively and to place at his disposal sufficient funds with which to assure adequate operation. The bill concerns:

1. Increased production of power available for war industries and shipyards.
2. Economy in the use of fuel.
3. Reduction in the railroad freight load, especially in the fuel load.
4. Increased production of metallurgical coke, toluol, ammoniacal liquor, all recovered from coal.

The greatest immediate need is perhaps that of the munition factories and shipyards for additional power, which cannot be supplied by the existing supply companies, by the most economical and efficient means of producing power, and to decrease the amount of fuel to be transported by the railroads and in turn make possible an early electrification of congested railway lines, which Director General McAdoo prepared for only a few days ago. So the development of the proposed super-power station for directing the production of explosives, as the proper utilization of coal, will yield by-products.

Nearly every department of the government is in some way interested either in power itself or in one or more of the commodities which, under present circumstances, may be secured as by-products in the economical development of power or which in their manufacture give as by-products the requisites of power production.

In addition to our war needs there is a widespread demand for increased production and adequate distribution of fuel, light, heat and power for city and rural communities and industries, which will continue to increase after the war when the country will return to normal conditions and can and will compete for the trade of the world.

The plan adopted to solve any one of those problems should primarily include conservation of transportation and increased production of coal products and power. The appropriation required for all these is provided in the bill just introduced.

The bill grants sweeping authority to the President and includes penalties of imprisonment or fine or both for any who knowingly neglect or refuse to comply with any order or requisition made by the President or any officer, agent or agency designated or created under the act.

Among the clauses of the bill are those empowering the President:

1. To construct at any place or places within the boundaries of the United States such power plant or power plants as he may deem necessary, and in connection therewith to construct within such boundaries plants for the production of gas, coke, toluol, benzol, coal-tar products, and any other useful products that may be produced through or in connection with the coking of coal or lignite, or through or in connection with the combustion of any fuel.

2. For the purpose of increasing the capacity or productivity of any private power plant within the boundaries of the United States, to install in any such plant any structure, machinery or appliances that he may deem useful to that end, either through agents or contractors employed by him, or by providing the owner or operator of such plant with funds to be applied to that purpose; to lease the machinery, appliances and structures thus installed or any parts thereof to the owner or operator of such plant for a term of not to exceed the war period and such reasonable time thereafter as he may deem expedient in the interest of the United State, upon such terms as he may deem reasonable, and to enter into contracts requiring or permitting the lessee to purchase such appliances, machinery and structures, or parts thereof, at or before the termination of such lease at their then value or upon such other terms as he may deem equitable for the protection of the interests of the United States and of the community served by such lessee. Whenever any such structures, machinery or appliances shall have been installed, and until the sale or other disposition thereof, the title thereto shall remain in the United States and shall be free and exempt from any liens, mortgages, judgments or other incumbrances, whether created by act of the owner or operator of such plant or by operation of law. And upon and during any default in any payment of any sums due the United States under such lease or contract the President shall be empowered at all times to enter upon the premises upon which such machinery, structures or appliances shall be installed and there to maintain and to operate them or any of them for the use of the United States free from any rent or other charge, or to take possession of and remove them or any of them from the premises.

3. To aid in equipping any private power plant or in expanding any such plant to such extent as he may direct by making advances, upon such terms and conditions as he may determine, to the person operating or authorized to operate it, and in connection with such advances to agree with such person that, if the actual reasonable cost of equipping or expanding such plant shall be in excess of its value at the termination of the war period, or at such later time not more than five years after the expiration of the war period as he may deem reasonable for such valuation, and the machinery, structures or appliances constituting such extension or expansion, or their equivalent, shall have been maintained and operated in accordance with his directions until such time, repayment of the whole or any part of such excess will be waived, and to provide by agreement for the manner of determining such costs and values

by arbitration or otherwise and for the terms and time of such repayment; provided, that the powers conferred by this subdivision shall be exercised only if the President shall deem that the emergency is such as to render it impracticable or undesirable to act with respect to such plant under any of the other powers conferred by this act.

4. To acquire any private power plant within the boundaries of the United States.

5. To construct any pipe or other transmission lines, or other structures, facilities or appliances that he may deem necessary or useful for the purpose of better utilizing or of increasing the facilities of any power plant, or of combining the facilities or power of two or more such plants, or of better utilizing the gas, power or products generated by them.

6 To maintain, operate and extend any plant, pipe or other transmission line, or other structure, facility or appliance which he shall have constructed or acquired pursuant to the provisions of this act, and to deliver the power generated and the products produced in any such plant to such persons and in such proportions and at such times and at such rates as he may deem proper.

7. To require the operator of any private power plant within the boundaries of the United States to place at the disposal of the United States or to acquire from such operator during the war period the whole or any part of the power generated by such plant and during such period to transmit or distribute, or to require such operator to transmit or distribute, such power to any other power plant or to any other persons for such periods in such manner and quantities and upon such terms as he may direct.

8. To lease for the war period, or for such period thereafter not exceeding five years, or for any shorter period, and upon such terms as he may deem reasonable, to any person or body politic, for use in operation by such person or body politic, any plant, transmission line or other property or part thereof constructed or acquired pursuant to the provisions of this act.

9. In furtherance of any of the foregoing purposes, to modify, cancel or suspend any existing or future contracts for the delivery of power to any person not engaged in the production of war material, or to the extent to which he shall deem the power contracted for to be in excess of the requirements for the manufacture of war material by such persons or to which, in his opinion, it shall prevent the delivery of power which he shall deem necessary for the production of war material of greater or more immediate utility.

10. In furtherance of any of the foregoing purposes, to acquire any property or property rights, including any public or private rights, or any interest in any such rights; or any material, machinery, appliances or processes, patented or otherwise, which he may deem necessary or useful for the construction, development, expansion or operation of any such plant or transmission lines.

11. If in his judgment such action shall be necessary or useful for the purpose of this act, to form one or more corporations under the laws of any state, territory, district or possession of the United States for the purchase, construction, extension, lease, maintenance or operation of any such power plants or facilities, or for the merger or consolidation of any private power plants, or for the purchase of the whole or any part of the capital stock thereof or of the property thereof; provided, that not less than the majority of the capital stock of any corporation thus formed shall be subscribed and during the war period shall be retained by the United States, and that at no time shall it be a minority stockholder therein.

12. To sell or exchange any plants or structures constructed by him and any property to which he shall have taken title, and any rights acquired by him, whenever in his opinion the interests of the United States will be furthered by such sale; provided, that no public right acquired by him shall be alienated for any term in excess of five years after the war period, upon any terms or conditions other than those prescribed by the sovereignty from which such public rights shall have been acquired; provided further, that whenever, in the opinion of the President, any structure or appliance which he shall have installed in any private power plant, or any structure or appliance in any such plant to which he shall have taken title, or any property or right which he shall have acquired from the owner of such plant, shall constitute an integral portion of such private plant, or shall be of such character that it would be uneconomical to separate it therefrom, the owner of such private power plant shall be accorded an option to purchase the same at the then reasonable value thereof, to be ascertained either by agreement or by arbitration, wherein the President shall select one arbitrator, the operator a second and the two thus selected a third, before the same shall be otherwise offered for sale or exchange. . . .

That whenever any act done pursuant to the provisions of this act shall constitute a taking of private property within the meaning of the Constitution, just compensation shall be made therefor in an amount to be determined by the President; and if the amount so determined by the President is unsatisfactory to the person entitled to receive the same, such person shall be paid 75 per cent of the amount so determined by the President and shall be entitled to sue the United States to recover such further sum as added to said 75 per cent will make up such amount as will be just compensation therefor, in the manner provided for by Section 24, paragraph 20, and Section 145 of the Judicial Code.

HEARINGS ON THE BILL

The War Industries Board, the Treasury Department and the Shipping Board served notice on the committee that it was desired that representatives of these governmental agencies should testify at the hearings which began Friday, Aug. 23. The hearings are open, and if public utility men desire to be present the committee will be glad to hear them. It is not known how much time the government officials will require for their testimony, but it is understood that members of the National Committee on Public Utilities, including P. H. Gadsden and E. K. Hall, will be present at the hearings and possibly testify.

The proposed emergency power act has the backing of the administration. The bill was drawn three months ago by the War Industries Board after consultation with J. B. McCall of Philadelphia, Mr. Gadsden and Mr. Hall. It was submitted to several public utility companies at the instance of different departments of the federal government which find themselves in need of additional power for war production with no appropriations or means of meeting their difficulties along that line. There has been much discussion in Washington of the difficulties of the public utilities, which in many cases the Capital Issues Committee has not been able to meet in the way public utilities have desired them to be met. There is in the bill a provision which allows the government to advance money to the companies. This would solve some of the difficulties encountered.

E. K. Hall, a member of the National Committee on Public Utility Conditions, informs the Washington correspondent of the ELECTRICAL WORLD that, if a suitable bill along the lines of the measure as it is now before the committee is finally drafted, the public utilities of the country ought to be in favor of it.

"It is hoped," Mr. Hall said, "that when the bill is reported from the committee it will be suitably safeguarded to protect the legitimate interests of the public utilities, and I am of the opinion that the War Industries Board has had that in mind and that the committee will have it in mind."

OPERATIONS OF BROKERS IN SUPPLIES FOR ARMY

Covenant in Contracts Not to Be So Used as to Harm Long-Established Business Customs or Curtail Industry

The War Department authorizes the statement that the President has agreed with the Secretary of War that the covenant to be inserted in all war supply contracts against the operation of contract brokers and other illegitimate business agents shall not be used in such a way as to be harmful to long-established business customs or to curtail industry.

In accordance with this agreement the General Staff has ruled that exceptions to the covenant will be allowed only in classes of cases first authorized by the Superior Board of Contract Review after finding that the best interests of the government require such exceptions.

The first ruling of the board covers manufacturers of cotton, woolen and worsted and silk-textile industries. The board has decided that there shall be added to the covenant a clause which shall exempt the manufacturer who handles his products through a selling agency or agencies which have handled such products prior to and since April 1, 1917.

Manufacturers and dealers who have the required supplies in stock may make contracts with the supply bureaus. Exceptions to this rule will be allowed only in cases first authorized by the Superior Board of Contract Review of the supply bureau affected after finding that the best interests of the government require such exceptions. The rulings of these boards are subject to the authority of the superior board.

LABOR SHORTAGE IN THE WAR INDUSTRIES

Shortage of One Million Men in War Industries Must Be Met by Drafts on Non-Essential Industries

Faced with a labor shortage in war industries of approximately a million unskilled laborers, and with a tremendous additional shortage coming as soon as the new army draft expansion increases the need for supplies, the United States Employment Service of the Department of Labor puts the problem of supplying these laborers up to the states. An early solution of the present difficulties is imperative for the reason that corresponding shortage in skilled labor is becoming apparent.

Reports from Pennsylvania show that the Midvale Steel plant at Coatesville has been forced to shut down certain units for lack of labor. As a result of shortage and of the placing of the burden upon the states, Georgia was notified that unless that state could at once furnish the eight-million-dollar picric acid plant at Brunswick with 5000 laborers, the entire construction force will be necessarily laid off and the plant moved out of Georgia.

Nathan A. Smyth, assistant director-general of the United States Employment Service, immediately notified all state directors of the service that the shortage of 1,000,000 men in war industries can and must be met by drafts upon non-essential industries, but that men cannot be taken from farms, railroads, mines or other war industries. It is pointed out that unless this labor demand can be met, the new army, which is to be raised by increasing the present age limit from eighteen to forty-five, may be faced with lack of equipment.

MUSCLE SHOALS POWER PROJECT IS SUSPENDED

Statement of the Reasons Given to the "Electrical World," by Assistant Secretary of War Crowell

The War Department, after consultation with the War Industries Board, has ordered the suspension of work on the dam and other construction for the hydroelectric power project at Muscle Shoals, Ala. This statement has been made to the Washington correspondent of the ELECTRICAL WORLD by Benedict Crowell, Assistant Secretary of War, with an explanation of this decision which is in effect as follows:

Mr. Crowell pointed out that no stoppage of work on the building of the nitrate plant at Muscle Shoals is in contemplation, nor is there any contemplation of stoppage of work at the Cincinnati, Toledo and other plants. There are estimates obtainable in Washington, in fact, that the nitrate plant at Muscle Shoals will be placed in production this year.

While the work on the hydroelectric development at Muscle Shoals is announced as being suspended temporarily, it is nevertheless the belief in Washington that this work has been suspended for the period of the war. Three years' time would be required to complete this work, and it is plainly stated at the War Department that in view of this fact the work is of a non-essential character. In other words, the belief is entertained in Washington that the war will be over before this particular power plant could be placed in production.

The decision to abandon the Muscle Shoals hydroelectric plant came as the result of a request to the War Industries Board that this project be placed on the list for priority as an essential undertaking, but the board held that the labor and material being used there and in contemplation are urgently required to meet more immediate war demands. In this view the War Department has concurred.

SAVING THE FUEL IN OFFICES AND STORES

The Bulletin of Massachusetts Fuel Administration Points Out Ways of Lessening the Waste of Coal and Energy

Bulletin No. 2 of the Massachusetts Fuel Administration, just issued, contains many valuable suggestions as to methods of saving fuel in office buildings, stores and isolated power plants. The bulletin was prepared under the direction of the advisory committee of engineers which is assisting James J. Storrow, Fuel Administrator of New England, in his drive to secure more economical plant operation, President Ira N. Hollis of the Worcester Polytechnic Institute being chairman.

Besides pointing out the necessity for reducing the demand for coal by all users, the bulletin discusses

general principles in coal saving, details the practices best adapted to economical use of fuel in the boiler room, engine room, lighting and heating systems, and outlines a fuel-saving staff organization for office buildings and stores, with a tabulation of the fuel-saving duties of each member.

Among the suggestions included are shutting off every unnecessary lamp and reducing the size of lamps where possible without the loss of good service, placing the watchman in charge of heating system operations in control of lighting and of lamps, modification of switching systems to give better subdivision, so as to light only parts of rooms in use, and the general use of tungsten lamps for less efficient units.

WORK IS PROGRESSING ON THE SKAGIT RIVER PROJECT

Plants of the City of Seattle and the Puget Sound Traction, Light & Power Company to Be Interconnected

Mayor Hanson, who returned recently to Seattle from Washington, D. C., where he, with other members of the Seattle committee, secured permission of the Capital Issues Committee to issue $5,500,000 bonds for development of the Skagit River power project, states that the city's victory is clean-cut and complete and that no conditions were placed upon the issue that cannot be met readily.

The Capital Issues Committee demanded that the plants of the city and the Puget Sound Traction, Light & Power Company be interconnected so that surplus power of either plant could be used, and both city and traction officials agreed to this.

The City Council of Seattle has taken immediate steps to make funds available for the preliminary work. An ordinance introduced by Councilman Fitzgerald provides for a loan of $100,000 from the general fund to the Skagit River project fund for beginning and prosecuting work pending the sale of bonds.

A report of City Engineer A. H. Dimock of the progress of the work to date shows that a survey has been completed for one-half of the road which the city must build between the end of the present wagon road and the power site, that good progress has been made on the topographic surveys at the site, and that other preliminary matters are going ahead promptly.

SEPTEMBER SERVICE OUTLET CAMPAIGN NEAR

Plans of Society for Electrical Development Fully Completed and Movement Will Increase Economical Use of Existing Appliances

Plans of the Society for Electrical Development, Inc., for the September service outlet campaign are fully completed. The society is sending from its office in New York detailed information which is of much help to the branches of the industry immediately affected by the movement. The direct purpose of the effort is to make more useful the appliances already owned by householders and to show them how to use labor-saving and coal-saving appliances to the best advantage. In doing this the society is emphasizing its desire to conserve existing materials in accord with the spirit of the rulings of the War Industries Board. By providing service outlets the society believes that the off-peak business of the central stations will be stimulated.

GOVERNMENT LOANS $2,000,000 TO UNION GAS & ELECTRIC COMPANY

Third Unit of 30,000 Kw. to Be Provided So that New Generating Station at Cincinnati May Supply Nitrate Plant

A loan of about $2,000,000 will be made by the federal government to the Union Gas & Electric Company, Cincinnati, for the construction of a third unit of 30,000 kw. at the new generating station. The loan will be for five years, but payable at option of the company at any earlier date. As agent for the government the company will build a transmission line from the station to the new government nitrate plant at Broadwell. This line, it is estimated, will cost $1,000,000. The company will deliver energy to the plant on or before July 1, 1919, with a minimum of 30,000 kw. and a maximum of 40,000 kw. for the first year.

Form of Weekly Report on Coal Adopted by the United States Fuel Administration

U. S. FUEL ADMINISTRATION
WASHINGTON, D. C.

In answering the last question, on other side, give the numbers of the coal districts, as assigned below:

1. Central Pennsylvania.
2. Butler-Mercer Region, Pennsylvania.
3. Pittsburgh and Panhandle.
   3a. Westmoreland Region.
   3b. Connellsville District.
4. Somerset, Cumberland, and Piedmont.
5. Fairmont District. 6B. Michigan.
6-7. Ohio. 8. Northeastern Kentucky.
9. High Volatile Fields, Southern West Virginia.
10. Low Volatile Fields, Southern West Virginia and Virginia Anthracite Field.
11. Other Virginia Fields.
12. Southeastern Kentucky, Tennessee, and Georgia. 13. Alabama.
14. Western Kentucky. 15. Indiana.
16. Illinois. 17. Iowa, Missouri, Kansas, Arkansas, Oklahoma, Texas.
18. Lake Docks. 19. Western Fields.

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300.

STATISTICAL DIVISION
United States Fuel Administration
WASHINGTON, D. C.

FORM G

UNITED STATES FUEL ADMINISTRATION
WEEKLY REPORT OF COAL SUPPLY

	Anthracite and Coke	Bituminous
Report for week ended		
Required for full operation		
Actual consumption		
Actual total receipts		
Stocks at end of last week		
Stocks at end of this week		
Day's supply on hand		
Coal en route, in addition to stocks		
Receipts, through local dealers (included in above)		

From what districts are you receiving bituminous coal (see over)?

Report only in net tons (2000 pounds). Fill out both cards, tear apart and mail every Monday. No stamps required.

This is the postal-card form provided by the United States Fuel Administration for the weekly report on coal supply for industries and public utilities. Identical postal cards, attached together, are to be mailed to the statistical division of the United States Fuel Administration and the office of the district fuel administration.

Maximum Price for Service.—The Maine Public Utilities Commission, in a case affecting the Cumberland County Railway & Light Company and the city of Portland, decided that it would not approve a provision in a contract between a public utility and a municipality which attempts to fix a maximum price for service.

Competing Company.—The Oregon Public Service Commission has decided, in the case of California-Oregon Power Company vs. Keno Power Company that the question of public convenience and necessity cannot be raised under the Oregon statutes by a company seeking to exclude another utility from the field, but can be presented only upon the application of the utility desiring to invade the field.

Discontinuance of Operation.—The Illinois Public Utilities Commission, in case No. 7631, compelled a utility to cease operating where it was shown that the property was in the hands of an unincorporated control which had acquired possession by an unauthorized sale, that standards of service were not complied with, and that the transmission line was in a condition which would render its use dangerous to the public.

Upholding Meters.—A decision of the Illinois Public Utilities Commission, affecting the Jacksonville Railway & Light Company, says: "This commission, in harmony with the rule of public utility commissions of other states, has held in favor of meters as against all other comparative tests as a basis of settlement of disputed claims. To set aside this determining agency for inferential reasons or personal opinions would open the way to endless controversy and question the accepted means provided for measuring the service rendered by a utility. The commission therefore finds that the complainant has failed to establish his claim for rebate for the alleged overcharge in this behalf."

Coal Cost in Electric Rates.—In allowing the DeKalb-Sycamore Electric Company to increase rates the Illinois Public Utilities Commission said in part in its decision: "It appears that in 1914 the company paid for coal delivered at De Kalb $1.99½ per ton, whereas under present conditions it is paying for a similar grade of coal $2.00½ per ton, and after the expiration of the coal contract April 1, 1918, this coal will cost $3.52 per ton delivered in De Kalb. Other operating costs have largely increased. It appears from testimony that after April 1, 1918, the cost of producing electric energy will be approximately 2.15 cents per kilowatt-hour, which is exclusive of any cost of distribution, general expense, meter reading, bill collecting, taxes, depreciation and interest upon the money invested. It appears from the statements of consumption which are submitted that under the existing rate some power consumers are securing energy at a cost of between 2 and 2½ cents per kilowatt-hour, which it is apparent will little more than pay for the actual production cost, to say nothing of meeting the other expenses properly chargeable to power service. Attention should be drawn to the fact that the power business of the company has increased remarkably during recent years. The revenue from commercial power service in 1914 was $19,909, and in 1917 this power revenue had increased to $30,330. . . . The property of the De Kalb-Sycamore Electric Company appears to be well managed and its operations appear to be efficiently conducted. Under these conditions the consumers are securing the benefit of reliable service and efficient, economical operation. It is no more than reasonable that under such circumstances the utility should be entitled to share in the benefits which arise from good business judgment and good management."

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Value of Water Power.—The Angelica Water & Ice Company, which the Pennsylvania Public Service Commission has authorized to increase water rates, included in its valuation testimony an estimate on a water power. In the course of its decision the commission says: "Respondent claims a potential power value for the Angelica Creek at the two lower dams of $26,856 in its reproduction cost new valuation, which appears to be based upon measurements of stream flow. In connection with its table of measurements it is stated that 50 boiler-hp. is available for seven months of the year for twelve hours per day, and intermittently for one month more, or substantially for eight months per year, and further that this amount of theoretical water power when converted into kilowatt-hours is worth, at 3 cents per kilowatt-hour, $3,222.72. Under the assumption that this situation relieves the company of 6 per cent interest on construction and 6 per cent for operation and maintenance, the capitalized value of this water power is estimated to be $26,856. The first error in this calculation is to omit a charge for interest, depreciation, taxes and insurance upon the necessary hydraulic development for a theoretical water power to utilize the 50 boiler-hp. The second error is the assumption that respondent would purchase electricity when it owns a steam plant and probably holds it in operation at all times to drive its pumps. The additional coal needed could be purchased cheaper than electricity in a normal market. The basis of any valuation of this potential horsepower therefore should be measured by the amount saved in buying coal instead of electricity. Upon this basis, accepting respondent's calculation as to the amount of potential horsepower, the value of the water rights should be placed at about $6,100 under the conditions that are normally existent."

Rate Increases and Financing.—In approving temporary electric rate increases for the war emergency by the Empire Gas & Electric Company, the New York Public Service Commission, Second District, said in part: "All parties to the controversy are to be congratulated and commended for taking such action as will enable the commission to fix emergency rates without a prolonged investigation involving perhaps a valuation of the company's properties in each community, and which would be conducted at a time when costs are shifting so rapidly that, whatever time might be taken as the basis of the calculation, the situation would probably be materially changed while the investigation was in progress. In fixing these rates the commission has not been unmindful, and, agreeing to submit the matter in this peculiar form to the commission's determination, the municipalities have not been unmindful, of the warning given by the Comptroller of the Currency in his report for 1917, and by the Secretary of the Treasury in his letter to the President of Feb. 15, 1918, that the existing conditions have thrown upon many of the public utility corporations strains which they are unable to endure without prompt help. . . . It is evident that if the public service corporations are to be permitted to make the most necessary extensions and improvements, or even refund outstanding capital obligations, the commission must insure to them such rates as will yield a revenue meeting the requirements of the War Finance Corporation. It is not proposed to permit those which are unnecessarily high in the present emergency, nor is it proposed to pursue a starvation policy, which, if the war should long continue, would inevitably deprive the public of all its utilities. The rates now fixed are emergency rates and are made effective only for a period of six months from the effective date of the new tariffs, and thereafter until the commission shall upon its own motion or upon complaint fix higher or lower rates. . . . It is estimated that these rates will afford such an increase in revenue as should insure the payment of interest on the funded debt and dividends upon the preferred stock. They should also provide a moderate surplus available for dividends on the common stock. They certainly will not yield so large a return as might reasonably be expected in normal times. We think, however, that the public service corporations must and do expect to submit to their share of the common sacrifice, and that neither the appeal of President Wilson nor the ruling of the War Finance Corporation had in view the maintenance in all cases of normal profits."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Arsenal Power-Plant Appropriations.—The War Department has been authorized to spend the following sums of money for improvement, maintenance and construction of arsenal power plants: Frankford Arsenal, Philadelphia, for improving the power plant, including necessary buildings, $205,000; Rock Island (Ill.) Arsenal, additional for improving water-power plant, $100,000, and for maintenance and operation of power plant, $20,000; Watertown (Mass.) Arsenal, for a power tunnel between power plant and shops, including piping, electrical distribution, mains, switchboards, etc., $70,000, and the appropriation of $20,000 for a power tunnel between power plant and shops made in the sundry civil appropriation act for the fiscal year 1918 is appropriated and made available as an additional to the foregoing sum; for repairing and electrifying five large planers and boring mills, $32,000. The total appropriation for this work reaches $447,000.

The Recruiting of Labor.—The Department of Labor authorizes the announcement that at the close of a three days' conference of employment managers, state employment agents and officials of the United States Employment Service instructions were sent out to war industrial plants concerning methods by which the central recruiting of labor will be put into effect. The conference, in which both state and federal agents as well as industrial management were represented, devoted itself to a consideration of methods by which the national system may be made most useful. The instructions which were sent out authorize under certain conditions war industries with field forces for recruiting labor to continue their use after Aug. 1, when recruiting and distributing unskilled labor will in accordance with the President's statement be unified in the national service. The labor recruiting organizations of private industry will, however, after that date operate only under the supervision of the United States Employment Service.

Hydroelectric Power Distribution in Sweden.—United States Consul-General Albert Halstead writes from Stockholm that the capacity of the water plants constructed in Sweden is about 4,000,000 turbine horsepower, of which 1,000,000 turbine horsepower was completed during 1917, one-fourth by the government and three-fourths by municipalities and private corporations, generally large industrial enterprises. The greater part of the energy produced, or say 92 per cent, is being utilized by the larger industries and 8 per cent by the so-called civil requirements, such as for illumination and for the lesser industries. Electrical power is obtainable in all the cities and larger communities of Sweden and to a considerable extent even out in the country. Extensive wiring out in the country is now taking place, the principal reason being the scarcity of illuminating oil as a result of the war. At the same time lively interest is being manifested to prevent the rural population from moving to the cities, and it is thought that power distribution may exert a certain amount of influence.

Electricity Increases Food Production.—That the production of foodstuffs has been increased $21,000,000 a year as a result of bringing 75,000 acres of land in southern California and the San Joaquin valley under production by electric irrigation in the past year is a feature of a statement made by President W. A. Brackenridge of the Southern California Edison Company recently. "The maintenance of continuous and reliable service and the extensions to serve essential industries and electric power for irrigation of agricultural lands are of such paramount importance that we believe that whatever rate adjustments may be necessary to maintain the company in a strong financial position to provide these services can be safely left to the Railroad Commission of the state," said Mr. Brackenridge. "We have received considerable assistance from consumers, who have purchased stock in our company in amounts necessary to finance extensions of our system for their requirements, thus adding to our already large number of stockholders throughout the vast territory which we serve in southern California."

Production and Shipments of Bituminous Coal.—The production of bituminous coal during the week of Aug. 10 decreased 278,000 net tons, or 2.2 per cent, and recorded the fourth successive week of decreased output. The decrease in production during this period was equivalent to 1,000,000 net tons, or 7.6 per cent below the record week of July 13, when production reached 13,286,000 net tons, and makes necessary an output of 14,500,000 net tons during the rest of the summer months to make up the deficit for the coal year to date. The output during the week of Aug. 10 (including lignite and coal coked) is estimated at 12,274,000 net tons, as against 12,552,000 net tons during the week of Aug. 3 and 10,636,000 net tons during the current week of 1917. The average production per working day during the week of Aug. 10 is estimated at 2,046,000 net tons, as compared with 2,092,000 net tons during the week preceding and 1,773,000 net tons during the week of Aug. 10, 1917. The daily average during the current week fell 54,000 net tons, or 2.6 per cent behind the daily summer requirements established by the United States Fuel Administration.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Unprofitable Extension No Ground for Refusing to Comply with Commission's Order.—That a project of extending gas mains, considered as an independent entity, will be unprofitable is no ground for refusing to comply with an order of the Public Service Commission for such extension, the Supreme Court of New York held (170 N. Y. S., 1009).

Power of Commission.—The Common Pleas Court at Hamilton, Ohio, in the case of King Powder Company vs. Thrasher & Leslie, receivers, held that the act creating the Ohio Public Utilities Commission is valid and enforcible in so far as it vests in the commission control over railway rates. It also held that the power of the Public Utilities Commission is not restricted by contracts affecting private interests, and an agreement whereby a right-of-way was granted by a corporation to an interurban railway company in consideration of the employees of the corporation being carried for certain fixed rates of fare is not enforcible against the railway or its receivers, notwithstanding that the contract antedates the passage of the public utilities act.

Reliance on Assurances of Foreman.—Where the assistant foreman's testimony showed that he was the vice-principal, the employer had the right to rely on his statement that electricity in a transmission wire was turned off when he ordered the employee to cut the wire; hence it was immaterial whether rubber gloves or other instrumentalities should have been used, the Supreme Court of Appeals of Virginia held in Lynchburg Traction & Light Company vs. Gordon (96 S.E. 195). If the assistant foreman ordered employee to ascend pole and cut wire, and assured him that there was no current in the wire, and plaintiff, relying on such assurance, took hold of the wire and was injured, he could recover. An employee injured by touching a live wire which the foreman has assured him was dead had the burden of proving that the foreman ordered him to cut the wire and assured him it was dead. If the employee who was an experienced lineman, working about highly charged wires daily and knowing how to handle them, obeyed an instruction, given without assurances, to cut a wire, he could not recover when burned by the current in the wire. If the foreman, in the discharge of a non-assignable duty, assured the plaintiff that the wire was dead, there was nothing upon which the doctrine of assumed risk could rest.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Harry Ridgeway has been appointed to succeed Wallace Foster as manager of the Marin district of the Pacific Gas & Electric Company.

Warren T. Bulkley, former plant supervisor of the Danbury & Bethel Gas & Electric Light Company, Danbury, Conn., is now general superintendent. He has been in this company's service for a number of years.

L. G. Scott, formerly head of the underground department of the Cumberland County Power & Light Company, Portland, Me., has joined the staff of the Cumberland Shipbuilding Company as electrical engineer, with headquarters at Portland.

Frank C. Kidder, business manager of the Newburyport (Mass.) Gas & Electric Company, has been appointed a personnel officer in the bureau of production and engineering of the War Department. He is under orders to report in Washington, Sept. 3.

Stanley N. Abbott, assistant sales manager and office manager of the Hygrade Lamp Company, Salem, Mass., has entered the Officers' Training School for the Ordnance and Quartermasters' Departments, at Camp J. E. Johnston, Jacksonville, Fla.

Carl Allenbach, commercial manager of the Spokane (Wash.) Gas & Electric Company, left that city recently for New York, where he will be in the purchasing department of the Henry L. Doherty Company. He will be succeeded by Luther Gaston of Knoxville, Tenn.

John W. Brooks, general manager for Pass & Seymour, Solvay, N. Y., manufacturer of electrical specialties, has been appointed a member of the new Community Labor Board for the Tenth District, now being formed for the purpose of conferring on labor problems which may arise during the period of the war.

J. Kappeyne, formerly chief engineer of the Public Utilities Commission of the District of Columbia, has recently been appointed transportation engineer to the United States Fuel Administration for the State of Illinois, with headquarters in Chicago. Means for promoting the conservation of fuel by the various electric railway companies of the state will be worked out by Mr. Kappeyne.

Howard M. Turner, assistant to the president Turners Falls Power & Electric Company, with headquarters at Boston, has received a commission as first lieutenant in the Engineering Corps, U. S. A., and has been stationed at Camp Lee, Petersburg, Va. Lieutenant Turner has been prominently identified with the hydraulic engineering development of the Turners Falls system for some years, and the recently completed hydroelectric plant at Montague City, Mass., was designed and built largely under his engineering supervision. He has made numerous investigations of water-power problems and had a part in important commission work at Boston, where he has been assistant to Philip Cabot, head of the Turners Falls system, for about two years.

Monro Grier of Toronto, the new president of the Canadian Electrical Association, is vice-president and solicitor of the Canadian Niagara Power Company, Niagara Falls, Ont. Mr. Grier was born and educated in England, was enrolled as solicitor there in 1882, was called to the Ontario bar in 1884 and created King's Counsel in 1902. He has had an extensive legal practice in the Dominion. He was engaged as junior counsel for the Canadian Pacific Railway in its arbitration proceedings with the Dominion government, and later in arbitration and litigation with the railroad contractors on the Lake Superior section. He engaged later principally in parliamentary practice, until 1901, in which year he was appointed secretary and solicitor for the Canadian Niagara Power Company, of which in 1905 he became vice-president.

Obituary

Willis L. Brownell, Manchester, Conn., ex-treasurer of the Crocker-Wheeler Company, Ampere, N. J., manufacturer of generators, motors, etc., died on Aug. 11, at his home, aged seventy-two.

N. Bruce MacKelvie, vice-president of the Nassau Light & Power Company, Mineola, N. Y., and a director in a number of other corporations, suffered a stroke of apoplexy while bathing off the shore of his estate at Sands Point, Port Washington, L. I., Aug 17, and was drowned.

Sergeant Richard H. Stewart, for the last two years treasurer of the New York Electric Installation Company, New York City, and for many years previously associated with the Dale Lighting Fixture Company and the Acme Gas & Electric Fixture Company, is reported by the government as having been killed in action on July 17. Sergeant Stewart went to France early in the spring with the 308th Infantry.

V. A. Henderson, secretary of the Memphis Gas & Electric Company, Memphis, Tenn., died suddenly Aug. 19. Mr. Henderson was for a number of years secretary and commercial manager of the Merchants' Power Company of Memphis, which was recently consolidated to form the present Memphis company. He was one of the most popular central-station commercial men in the country and was well known not only in the South but throughout the entire United States.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Pennsylvania Electric Association.—The annual convention of the Pennsylvania Electric Association will be held on Sept. 6 and 7 at Bedford Springs. The program of the meeting will be given in a later issue.

Kansas Public Service Association.—On Sept. 17 to 19 the Kansas Public Service Association will hold its annual meeting at Kansas City, Kan. The secretary-treasurer of this association is W. W. Austin, Cottonwood Falls, Kan.

Engineers' Club of Northern Minnesota.—W. J. Downing, chief engineer of the Shenango Furnace Company, has been elected by the Engineers' Club of Northern Minnesota as its representative on the Minnesota Joint Engineering Board.

American Electrochemical Society.—The fall meeting of the American Electrochemical Society will be held at Princeton, N. J., from Sept. 29 to Oct. 1. The secretary of this association is Prof. J. C. Richards, Lehigh University, Bethlehem, Pa.

Smoke Prevention Association.—The annual convention of the Smoke Prevention Association is being held at Newark, N. J. The program, arranged by David J. Maloney, smoke inspector of Newark, vice-president of the association, includes a paper on "Boiler-Room Efficiency."

Electric Club-Jovian League of Chicago.—The annual outing of the Electric Club-Jovian League of Chicago was held at Ravinia Park on Aug. 22. C. W. Pendell was chairman of this outing. It is announced that the first meeting of the fall season will be held Sept. 5 at the Hotel Sherman.

Pacific Division Electrical Supply Jobbers' Association.—It has been announced that the Pacific Division of the Electrical Supply Jobbers' Association has postponed its meeting from Aug. 12 and 14 to Sept. 9, 10 and 11. This meeting will be held in Portland, Ore. This change was made because the Northwestern Electric Light and Power Association will hold its meeting on Sept. 13 in the same place.

Minnesota Joint Engineering Board.—This association called a meeting for Wednesday evening, Aug. 7, at St. Paul to meet Alfred D. Flinn, secretary of the Engineering Council. Mr. Flinn explained the work of the United Engineering Societies, the Engineering Foundation and the Engineering Council and asked for suggestions from the engineers of Minnesota and adjacent territory as to how these three organizations can serve them best.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

ELECTRICAL EXPORTS LARGER FOR THE MONTH OF MAY

Figures for First Five Months of Current Year Reach Total of $22,837,665; for Eleven Months, $49,507,951

Exports of electrical merchandise during May last were larger than for many months previous, excepting March. The value of the electrical commodities exported in May was $5,013,379. This brings the total for the first five months of the current year up to $22,837,665.

May, 1918, exports compare favorably with May, 1917, exports in every way except insulated wire and cable, which showed a falling off of roughly 50 per cent.

For the eleven months ended May last the exports amounted to $49,507,951, compared with $46,323,381 and $27,103,876 for the corresponding periods of 1917 and 1916.

The accompanying figures were compiled by the Bureau of Foreign Commerce:

Articles	May		Eleven Months Ended May	
	1917	1918	1917	1918
Batteries	$204,526	$308,895	$2,566,830	$3,079,522
Carbons	.....	112,903	.....	1,407,133
Dynamos or generators	235,768	443,331	2,276,929	2,554,620
Fans	66,604	120,930	403,072	653,852
Heating and cooking apparatus	.....	48,492	.....	484,803
Insulated wire and cables	628,384	344,186	6,558,969	5,376,137
Interior wiring supplies, including fixtures	121,928	140,050	1,020,933	1,393,504
Arc lamps	1,643	1,085	14,691	13,218
Carbon-filament lamps	15,356	10,459	136,464	140,776
Metal-filament lamps	346,037	309,413	1,786,527	2,707,253
Magnetos, spark plugs, etc	.....	160,395	.....	2,999,615
Meters and measuring instruments	84,294	161,431	955,077	1,383,901
Motors	427,224	574,437	5,245,908	6,077,222
Rheostats and controllers	.....	28,516	.....	187,889
Switches and accessories	.....	148,359	.....	2,040,615
Telegraph apparatus, including wireless	101,940	32,339	519,474	282,638
Telephones	156,917	251,785	1,670,352	2,292,120
Transformers	151,766	214,958	1,103,279	1,771,652
All others	2,047,888	1,601,415	22,064,876	14,661,481
Total	$4,590,275	$5,013,379	$46,323,381	$49,507,951

NON-ACCEPTANCE OF BILL ON PART SHIPMENT A HARDSHIP

Government Departments, by Holding up Payment Until Complete Delivery, Make It Difficult to Check up Materials

Electrical jobbers would find it much easier to supply the government if the various departments for which the equipment is ordered would accept a bill covering partial shipments. With deliveries so uncertain partial deliveries are unavoidable in many cases unless the jobber wishes to hold up the shipment until he is able to ship every part of the order. To do this, however, would not be rendering the best service to the government, which as a rule wants and needs the goods just as soon as they can be shipped.

By refusing to accept partial shipment bills the government forces the jobber to hold all charge tickets until the last item is shipped. When, as in an order to a jobber, a hundred or so different items are required, it is frequently found that the stock of a particular item has been exhausted and the manufacturer can make no delivery for many weeks, sometimes months. In such cases the jobber must wait for his money until the last item is shipped.

That the jobber must wait so long for his money is not the only objection to this practice. By neglecting to accept billing for each shipment as it goes forward considerable difficulty must arise to the government when it does check the bills. If a period of three months should elapse between initial and final shipments it is easily conceivable that the checking at the end might disclose many items missing or, what is more frequently the case, damaged. A number of such instances have occurred, in one of which the government claimed not to have received a certain switchboard. A few months later it was found hidden under a pile of other stuff that had been received later. The board was in no condition to be used.

ENGLAND LOOKING TO TRADE AFTER THE WAR

Roughly 50 per Cent of United States Electrical Exports Go to British Home and Colonial Markets

For some months the English electrical interests have been making a study of conditions in order to make some plan for trade after the war. The Board of Trade departmental committee, in its report on electrical manufacturing, laid considerable emphasis on the unfavorable comparison between German and English electrical foreign trade. The report indicated clearly that the English manufacturers intended to compete with Germany for markets that Germany enjoyed prior to the war.

At the end of its report the committee drew the following conclusions:

"1. That the earnings of electrical manufacturing concerns have been insufficient, in most instances, to attract capital for development.

"2. That electricity has not been used in this country to the same proportionate extent as in Germany or America.

"3. That the necessity of retaining the home markets as a basis of overseas trade has never been properly recognized in this country.

"4. That our fiscal system has in the past operated adversely to our manufacturers.

"5. That the dependence of manufacturing upon finance has not been generally appreciated, and, in contrast with German practice, British financiers, when providing funds for enterprises, have not been accustomed to impose conditions insuring the use of British-made goods for original equipment, extensions and renewals.

"6. That the government and public of this country have been unduly influenced by the fear that combination or association might result in enhanced prices, and have lost sight of the advantages attending combination or association—such as reduced cost by producing in large quantity in standard patterns, and the united front which can be presented in competing abroad against foreign manufacturers.

"7. That in Great Britain the facilities for cargo handling and transport, including carriage by canals and waterways, compare unfavorably with those of Germany and America.

"8. That a better understanding between employers and employed, and better working and housing conditions, are essential.

"9. That after the war a large increase in every branch of electrical industry at home and abroad may confidently be expected, and that measures along the lines indicated in this report should be taken to secure the business for British manufacturers."

It thus is evident that English manufacturers intend to

make a vigorous fight for domestic and colonial markets.

In this connection, therefore, it would be interesting to see to what extent England and her possessions have purchased goods manufactured in the United States. The total for the fiscal years which ended June 30, 1913, 1914, 1915, 1916 and 1917 are respectively as follows: $12,608,295, $11,074,828, $11,390,786, $14,219,559 and $21,620,266. Incidentally these figures represent large percentages of the total electrical foreign trade of the United States as shown in the following: 1913, 47 per cent; 1914, 44 per cent; 1915, 57 per cent; 1916, 47 per cent, and 1917, 41 per cent.

The accompanying table shows how American manufacturers have been segregated in the foreign British markets. Particular interest attaches to the trade with Canada, the biggest foreign customer of American electrical goods, which roughly takes 25 per cent of the exports annually.

	1913	1914	1915	1916	1917
1 United Kingdom	$1,483,981	$1,791,835	$4,113,412	$5,815,371	$7,200,634
2 Bermuda	21,157	15,365	17,468	14,294	16,880
2 Br. Honduras	5,448	10,008	10,549	8,489	16,600
4 Canada	8,695,473	6,667,277	4,253,557	5,196,874	9,928,311
5 Newfoundland and Lab.	82,062	79,762	49,258	84,531	183,140
6 Br. West Indies	60,195	69,711	56,237	57,110	111,465
7 Br. Guiana	17,888	19,382	20,502	12,640	36,494
8 Br. East Indies	480,462	397,757	352,888	416,754	849,419
9 Hongkong	50,363	59,155	47,514	115,147	75,485
10 Br. Oceania	1,330,969	1,583,085	2,131,504	2,011,758	2,692,094
11 Br. Africa	377,314	379,633	333,945	479,913	479,969
12 Egypt	2,983	1,858	3,952	6,678	29,775
Total	$12,608,295	$11,074,828	$11,390,786	$14,219,559	$21,620,266

METAL MARKET SITUATION

Increased Activity in Copper Due to Price Remaining Fixed Until Nov. 1—Tin Continues Lower

Consumers who have been hanging back on the theory that the price of copper might be reduced are now placing their orders because of the government announcement that the price will continue at 26 cents until Nov. 1. Producers are booking sales up to the limit of their assumed ability to make delivery through September and October.

The price-fixing committee's plan was to have the maximum price of 26 cents a pound remain in effect until Dec. 15. On the protest of the producers, however, this time was shortened to Nov. 1. It would seem that what has happened gives assurance that there will be no overproduction during the remainder of the war and that the return of peace will find reviving industry dependent wholly upon the then current volume of output. Therefore there is a great likelihood of higher prices for copper after the war.

There has been no real market in tin for some days, owing to the lack of demand, but prices may be said to be 1 cent per pound lower than the general market of last week.

The price of spelter is advancing, owing to the reduction of surplus stocks. It is said that if the present reduction continues for another month, half of the surplus of prime Western spelter will be wiped out.

NEW YORK METAL MARKET PRICES

	Aug. 13	Aug. 21
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	29.25	29.25
Lead, trust price	8.05	8.05
Antimony	13.50 to 13.75	14.25 to 14.37½
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	Govt. price 15.00	Govt. price 15.00
Spelter, spot	8.80 to 8.90	9.35 to 9.47½
Tin, Chinese *	91.00	90.00
Aluminum, 98 to 99 per cent	Govt. price †33.10	Govt. price †33.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.50 to 24.50	23.50 to 24.50
Brass, heavy	14.50 to 15.00	14.50 to 15.00
Brass, light	11.50 to 12.25	11.50 to 12.25
Lead, heavy	7.12½ to 7.50	7.50 to 7.75
Zinc, old scrap	5.50 to 5.75	6.25 to 6.50

* No Straits offering. † In 50-ton lots or more; carload, 33.10 cents per lb.; 1-ton to 14-ton lots, 33.20 cents per lb.

THE WEEK
IN TRADE

HEAVY government construction is maintaining an active market in all lines which can supply the demand. There is some talk of supplying material only on government order on account of the difficulty of replacement. Considerable construction of essential plants is in progress in the West. A central station on the Pacific Coast has bought land for building a new power plant, and efforts are being made for tying the companies together and diverting the power for war work.

The labor situation everywhere is unsettled on account of the pending draft regulations. This is probably a temporary flurry and will be cleared up when the new bill is on the statute books. New wage decisions are also noted on the Pacific Coast, the skilled workers seeming to take advantage of the limited supply of trained men.

In general, the idea seems to prevail that the demand for material will always be greater than the supply. Chicago is bidding for large war contracts on the ground that it is the center of railroads and an ideal place to secure raw materials. Moreover, the apparent decrease in population leaves adequate accommodation for housing war workers. This is shown by a recent survey of vacant apartments and houses in one district of the city.

As was noted last week, material is being sold at the current prices at the time of sale—that is, the prevailing price at the time when the order is placed is disregarded if any advance has been made by the time of delivery.

Electrical welding of ships, instead of riveting, is attracting considerable attention in the Northwest. An aggressive campaign in this section for government contracts has greatly stimulated business in all lines. Some industrial plants are building or enlarging their factories to take care of this increased work.

No summer let-up is noted in the East, and from all indications there will be no reduction in demand for materials.

As the length of time since the United States has been at war increases, the need of eliminating non-essentials seems to become more fully realized and voluntary efforts are apparent for directing our total efforts and materials toward the task of winning the war.

NEW YORK

Staples are becoming difficult to obtain on account of the shortage of materials and the drain of man power for work in government plants. This entails a hardship on the jobbing industry, especially taking into consideration the uncertainty concerning the government's final course. Sales are not the question at this time; it is merely a question of supplying the demand. Any product that uses steel, copper, rubber or brass is bound to be restricted in manufacture, and the amount of these materials that can be obtained will depend entirely upon the necessity of the device.

CONDUIT.—Not much conduit is to be had because of the large demand by the government for industrial plants.

WIRE.—The wire shortage is due to the need of the government for certain sizes of wire for use in the field. It is predicted by one jobber that there will be an extreme shortage in B. & S., gage Nos. 14, 16 and 18. The prices remain unchanged for copper wire.

LAMPS.—Lamps can be had in some quantities to supply the heavy demand from industrial plants.

FANS.—Practically all fans of the larger size were sold during the hot weather of the last few weeks. One jobber states that he has a stock of fans under 12 in., there being

very little sale in the smaller sizes. It is believed that this is due to the short, intensive hot-weather period this year, which led to the purchase of fans large enough to give material relief. Moreover, the popularity of small-size fans several years ago contracted the future market.

FARM-LIGHTING SETS.—An increasing demand for farm-lighting sets seems large enough to insure heavy sales until the advent of winter, when it will not be so easy to get into communication with farmers.

POLE-LINE HARDWARE.—The fact that there is no new line construction in this vicinity reduces the demand for pole-line hardware and line material.

CHICAGO

Chicago is being depopulated by the increasing drain of men to work in Eastern and Southern war industries. It has been estimated that as many as 125,000 men have left the city in the last six months. New drafts of unskilled laborers already made or announced by the United States Employment Service will take perhaps 50,000 more men out of Chicago and neighboring territory by Oct. 1. These figures count only the workmen. To them must be added a certain percentage of the wives and children of these men, who will gradually move away to join the head of the family.

There has just been made a survey of the territory in Chicago south of Thirty-first Street and east of Halsted Street as far south as the city limits. The figures show that there are in this comparatively small part of the city nearly 5000 vacant flats, something like 800 vacant houses and about 12,000 vacant rooms. To a considerable extent the same conditions prevail in other parts of the city. Chicago is close to the coal mines, to iron and steel and all the raw materials needed in the manufacture of munitions. It is the greatest railroad center in the world and also has the additional advantage of lake transportation. It stands in the center of a great food-producing country. Most important of all, Chicago and the territory about it are not already congested by more freight and people than can be easily handled.

There is every reason why practically all the new and tremendous war orders of the government should be placed in Chicago or nearby territory. Looked at, not from a sectional and profit standpoint, but solely from a national and patriotic angle, the Middle West is the proper location for new government plants, as well as for the placing of government orders in plants already established and not now engaged in war work. A suggestion has recently been made that a conference on this subject be held in Chicago in the near future, and steps are being taken to carry out this suggestion

FANS.—Despite the recent hot spell, fans are reported to be in fair condition.

WIRE.—Deliveries on various sizes of wire from one large Chicago factory range anywhere from six weeks to six months. It is stated that 70 per cent of the work turned out by this factory is for government purposes.

INDUSTRIAL LIGHTING FIXTURES.—The demand for fixtures for use in industrial plants, especially the adjustable type, is great. Deliveries are good.

WASHING MACHINES.—One large manufacturing concern that builds about forty-five machines a day states that its entire output for the year 1918 was sold by the middle of February. The recent ruling of the government placing this industry in class B and allowing it 75 per cent of the material that it used during 1917 will cut the production of this manufacturer and many others to a great extent. Many of the washing-machine manufacturers have increased their output and enlarged their plants in the last six months, but they will be allowed material only on the 1917 basis.

FARM PLANTS.—The fall selling season is well under way, and the demand for farm plants is exceedingly great. Most manufacturers, however, say they are in a position to make good deliveries.

BOSTON

A very busy summer is being experienced by the trade, and as the country's great war machine accelerates its relentless advance little is heard of any prospective recession below present levels of sales. Collections continue fairly satisfactory, although in some quarters difficulties are being experienced in obtaining prompt remuneration for shipments forwarded for government use on the receipt of oral orders from army officers Stocks are rather uneven at the moment. In some lines jobbers are husbanding their material in view of the difficulties of replacing it except for specific war orders. This is particularly the case with conduit, which now goes forward only on the strength of bona-fide war industry work. There is much uncertainty in the trade as to the scope of the new draft law and its consequent effect upon the supply of trained men. Labor conditions in the electrical field are steadier this week than for some time, barring a threatened strike on certain suburban trolley lines at Boston. Deliveries are still greatly handicapped by insufficient railroad service In general, the trend of prices is still upward.

WIRE AND CABLE.—Government orders hold the center of the stage. Prices are running higher than a month ago, by and large. The demand for cable for war plants continues most active, and rush motor-truck deliveries are being called for even in some cases where the regular railroad facilities might meet the situation.

LAMPS.—Stocks are in better shape than for some time, especially in the ordinary sizes of tungsten unit. The activities of the Fuel Administration are influential in reducing consumption sufficiently to permit the accumulation of stocks to proceed more rapidly than is normal for this time of year. Dealers look for heavy fall trade in sizes below 40 watts.

IRONS.—Trade is remarkably good, considering the small amount of advertising at present being displayed. There is a scarcity in New England of one of the most prominent makes of irons, due probably to the commandeering of steel en route to the factory. Other competing makes are consequently being heavily drawn upon.

FANS.—Jobbers wh have pushed good lines and followed up sales opportunities consistently report an excellent fan business this summer, despite the protracted cool weather of last month. In such cases few fans will be carried over until spring. There is some discussion in the trade as to whether fans are essential products or not, but the feeling is widely prevalent that any electrical device which increases the comfort of the war worker under adverse weather conditions and thus tends to yield increased output cannot be regarded as a non-essential. Not long since the government commandeered a carload or two of fans for its own uses, and those in the trade who hear of this action find it hard to believe that the electric fan will go into the limbo of things not needed in the industrial war program.

MOTORS.—Sizes up to and including 10 hp. can now be had freely for immediate delivery. One Boston jobber reports a stock of 700 motors not exceeding 10 hp. rating. These have been gradually accumulated as the result of far-sighted buying, and as the revamping of industrial motor installations becomes more general in the interests of fuel and energy saving the trade is expected to become brisker in these smaller units. Large motors are less readily obtainable in comparison with the smaller ones. Prices hold firm and the war plants are still buying liberally.

ELECTRIC RANGES.—The quiet but none the less insistent demand for electric ranges continues. The total volume of business is, of course, far below that of normal times, and the central stations are not as actively interested as in the days when "priority number" was an unknown term. The outlook for material is too uncertain at this time to justify any widespread campaigning of the house-to-house order, in the opinion of central-station men. The jobber, too, looks upon the electric range as an uncertain quantity from the standpoint of supply. Close ob-

servers believe, however, that it will be impossible to hold back the development of this class of business so long as a fair supply of material can be applied to this use, and that the close of the war will find many more ranges in service than were in operation in 1914.

POLE-LINE MATERIAL.—The New England market is fairly dull in this branch of the supply business. Central stations are doing little beyond piecemeal construction in connection with war industry plants, and the electric railway market is below par, though some additional revenue is being derived from higher rates.

SEATTLE—PORTLAND

Both wholesalers and retailers report the volume of sales in the past week as excellent and showing a slight increase over the last two weeks. The increase was not along any special line, but consisted of heavier buying along general lines. Recent contracts for steel ships let in Seattle presage still heavier buying in the immediate future. Industrial sales to both steel and wooden yards and to foundries and machinery manufacturing plants operated in conjunction, keeping up remarkably well. Portland territory reports proposed immediate electrical installations in industrial plants in that city. The Pacific Coast Steel Company, Portland, is proceeding with the installation of a plant consisting of two 40-ton open-hearth steel furnaces and rolling mills, all equipped with electric drive.

The starting of operations in the new steel yard with five ways, which has contracts for ten 9500-ton ships; the enlargement of the wooden shipyard from two to four ways, with the receipt of additional government contracts, and the enlargement of other industrial plants are the features of the news from Portland.

The city of Seattle lighting department recently awarded contracts for eight 1000-kva. transformers to be used in shipyards where the city is furnishing a large amount of energy.

Northwest shipyard owners are deeply interested in experiments being conducted in the electric welding of steel ships in place of riveting. The experiments are authorized by and under the supervision of the Shipping Board. Experiments so far conducted have included welding of beveled joints, lap joints and butt joints. The reaming done under this process is asserted to have been excellent, and electric welding is said to be faster and cheaper than riveting and a great labor saver.

Spokane reports that state industrial plants throughout the Inland Empire reflect progress and healthful manufacturing conditions. Coupled with the building of new factories is the enlargement of older concerns, adding of extra shifts and taking on of heavier contracts. More war orders are being placed since the adaptability of plants in this section has been proved and since an aggressive campaign to secure government business has been waged.

Jobbers and manufacturers in Spokane report business brisk in most lines. Building conditions in the Northwest along residence lines specifically continue to attract attention. This is especially true in Seattle, where building permits issued this year up to date exceed in valuation permits issued for the entire year of 1917. In response to the call for new homes, 5000 in all, it is of interest to note that 1109 residences are now building in Seattle.

Labor shortage continues to harass business. In the steel shipyards in Portland, Tacoma and Seattle the situation is acute. Seattle has appealed to professional and business men to give their services for sixty days, and Portland expects to make a like appeal. The power apparatus demand is good and increasing, but stocks are low and hard to replenish. Equipment moves almost as fast as it is secured. Portland territory reports low stocks, and the consequent difficulty in securing motors and transformers of high rating is having a tendency to slow down the establishment of new industries and enlargement of existing ones.

Domestic appliances are moving well, with washing machines an easy leader. Stocks are becoming depleted, and shipments are coming through very slowly. Range sales show but little fluctuation. Wire is becoming exceedingly difficult to obtain. It is anticipated that dealers will soon be unable to obtain stocks except for war work. Shortages still exist in rubber-covered and stocks of the larger sizes. In industrial plants, whenever possible, substitution is resorted to. The demand for residence wire, including devices, is steadily increasing. Collections are very good.

SAN FRANCISCO

An unusual amount of construction work, actual and contemplated, was announced during the past week. There are unmistakable signs that private and non-essential building will be limited to the vanishing point, not alone from shortage of material but from sentiment; for several municipalities, when asked to revise wiring regulations in accordance with the present rate of demand and supply, answered that they would not do so unless such action was necessary for the government and its allied industries. The city of San Francisco, for instance, made such a decision. Government building contemplated includes fourteen permanent buildings for the Marine Brigade barracks at Dutch Flats, near San Diego, the construction totaling $1,500,000 of a permanent character and $500,000 more for temporary structures.

The sea-plane station at North Island, near San Diego, will be immediately enlarged by the construction of hangars, landing places and quarters for men and officers.

The Universal Gas & Electric Company of San Francisco has signed a new wage agreement granting a minimum wage to journeymen electricians of $5.80 per day and to cable splicers of $6.80 per day. Workmen employed by the San Francisco Board of Electricity have requested that their wages be increased to $6.50 per day. Other construction announced consists of $100,000 for Visalia hospital, a forty-thousand-dollar addition to the Stanford hospital of San Francisco, a number of buildings for miscellaneous purposes by the Southwestern Building Company of San Pedro, a hundred-thousand-dollar hotel at Woodland, a hundred-and-fifty-thousand-dollar cyanide plant at Azusa and a calcium-carbide plant at the National Carbon Company's factory in San Francisco. The San Joaquin Light & Power Company has purchased a five-acre tract in the outskirts of Fresno for a new power plant. A large number of New Power Company installations all over the state, are reported, along with the tying together of systems and the diverting of power to war-plant areas. The Pacific Gas & Electric Company has constructed a new substation (E) in the Mission section of San Francisco to handle power for part of the Ocean Shore Railroad and the municipal railways in San Francisco and eventually to transmit it to the new territory opened by the construction of the Twin Peaks tunnel.

STREET LIGHTING.—Santa Barbara and Salinas report consideration of street-lighting projects, but it is very probable that, as was the case with Fresno, the State Council of Defense will recommend that they take a patriotic view of these enterprises if they are non-essential.

RAILROADS.—The Northern Electric Railway is considering the construction of a new freight terminal at West Sacramento. The San Francisco municipal railroad will be extended into the Parkside district to Twentieth Avenue. The subject of an extension of the municipal railroad to serve the Union Iron Works was reported by the city engineer, to cost more than $400,000 with a period of construction so indefinite that it would not serve the present urgent need. Another plan of serving the Union Iron Works from Potrero Avenue over Seventeenth Street, at an estimated cost of $180,000, was recommended.

BELLS.—The reported big advances by Eastern factories in the price of bells, including skeleton weatherproof, watertight and iron-box, have sent dealers scurrying for government priority orders on which they may base their own protection stock orders. These advances, it is reported, will average from 33⅓ to 50 per cent over previous prices.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List Per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	12½%—57.25
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	12½%—66.75

Twin-Conductor

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	12½%—97.75
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	12½%—126.80

DISCOUNT—CHICAGO

Single-Conductor

No. 14 Solid	
Less than coil	+20% to List
Coil to 1000 ft	5% to 15%
No. 12 Solid	
Less than coil	+20% to List
Coil to 1000 ft	5% to 15%

Twin-Conductor

No. 14 Solid	
Less than coil	$115.00 to $80.00
Coil to 1000 ft	98.80 to 75.00
No. 12 Solid	
Less than coil	+20% to +5%
Coil to 1000 ft	5%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	12%
1/5 to std. pkg	20%
Std. pkg	44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	List to 20%
Std. pkg	25% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35—.36	.35—.36
50 to barrel	.31—.32	.32—.33
Barrel lots	.28—.289	.29—.299

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.319 to .322	.329 to .332
Barrel lots	.289 to .292	.299 to .302

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00—82.50	$69.75—75.00
⅜-in. double strip	75.00—82.50	72.00—75.00
½-in. single strip	100.00—110.00	93.00—100.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00 to $78.75	$63.75 to $71.25
⅜-in. double strip	78.75	71.25
½-in. single strip	100.00 to 105.00	75.00 to 95.00
½-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.07	1¼	.33
¾	.09	1½	.40
¾	.12	1¾	.47
⅞	.15	2	.55
1	.18	2¼	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	25.00–55.00	24.00–24.45	21.50–23.00
½-in.—	30.00–60.00	27.00–27.28	23.50–26.00

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$60.00	$30.00	$26.50
½-in.—	65.00	32.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
¼	$0.08¼
⅜	.08¼
½	.08¼
¾	.11½
1	.17
1¼	.23
1½	.27½
2	.37½
2½	.58½
3	.76½

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
¼	$0.05	$0.19
⅜	.06	.19
½	.07	.19
¾	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.50
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	¼ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	7% to 12%	10% to 15%
2500 to 5000 lb.	9% to 14%	12% to 17%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ to ½ In.	¾ to 3 In.
Less than 2500 lb.	+5% to 6.8%	+3% to 8.8%
2500 to 5000 lb.	9.8 to +20%	11.8% to list

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00 to $6.00
Discount	30%

CHICAGO

List price	$5.50 to $6.00
Discount	25% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp	100	$0.25
35-amp. to 60-amp	100	.35
65-amp. to 100-amp	50	.90
110-amp. to 200-amp	25	2.00
225-amp. to 400-amp	25	3.60
450-amp. to 600-amp	10	5.50
600-Volt		
3-amp. to 30-amp	100	$0.40
35-amp. to 60-amp	100	.60
65-amp. to 100-amp	50	1.50
110-amp. to 200-amp	25	2.50
225-amp. to 400-amp	25	5.50
450-amp. to 600-amp	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$5.00 to $5.50
1/5 to std. pkg	4.50 to 4.75

Standard packages, 500. List, each $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$7.00
1/5 to std. pkg	$5.15 to 5.75

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA

105 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.30
60-watt—B	100	.35
100-watt—B	24	.70
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.53
25-watt—G 25	50	.55
40-watt—G 25	50	.55
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.77
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.10

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.20—$35.90
Coil to 1000 ft.	26.95— 27.18

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$35.00
Coil to 1000 ft.	26.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$21.75 to $30.00

OUTLET BOXES

Nos.	List, Per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	25% to 33%	20% to 27%
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Glavanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$21.00 to $38.00
1/5 to std. pkg.	17.85 to 19.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$16.80 to $24.15
1/5 to std. pkg.	15.80 to 21.00

Standard package, 2200. List per 1000, $20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net Std. Pkg. 3500 Std. Pkg. 4000
5½ N.C.—Solid Nail-it—N.C.

Less than 1/5 std. pkg.	$16.00 to $20.50	$32.00
1/5 to std. pkg.	13.60 to 15.60	27.20

CHICAGO

Per 1000 Net. Std. Pkg. 3500. Std. Pkg. 4000
5½ N.C.—Solid Nail-it—N.C.

Less than 1/5 std. pkg.	$11.70 to $18.40	$33.05 to $36.80
1/5 to std. pkg.	10.15 to 16.00	26.60 to 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10% to + 10%
1/5 to std. pkg.	5% to 8%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	List to 10%
1/5 std. pkg.	16⅔%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+5% to Net
$10 to $25 list	11% to 15%
$25 to $50 list	14% to 20%
	Low Grade
Less than $10 list	5% to 10%
$10 to $25 list	16% to 25%
$15 to $50 list	24% to 28%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+15% to +5%
$10 to $25 list	11% to List
$25 to $50 list	5% to 14%
	Low Grade
Less than $10 list	+5% to 5%
$10 to $25 list	8% to 16%
$25 to $50 list	24% to 28%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10%
1/5 to std. pkg.	5% to 8%
Std. pkg.	23% to 25%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10% to 20%
1/5 to std. pkg.	List to 16⅔%
Std. pkg.	25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	40% to net	30% to net
$2.00 to $10.00 list	10% to 40%	5% to 40%
$10.00 to $50.00 list	20% to 60%	10% to 52%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 40%	15% to 30%
$2.00 to $10.00 list	25% to 50%	15% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$6.00 to $6.50
Discount	25% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.434—$0.4625
No. 18, full spools	.384— .4425

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.69
No. 18, full spools	.55 to .575

WIRE, RUBBER-COVERED, N. C

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00–$20.00	$12.50–$15.00	$11.00–$11.25
12	21.29– 27.10	19.35– 23.20	17.05– 17.42
10	29.70– 37.80	27.00– 32.40	23.75– 24.30
8	41.90– 53.35	38.10– 45.70	33.45– 34.29
6	60.30– 84.40	54.27– 72.35	51.55– 53.05

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$19.00–$21.00	$14.00–$16.00	$12.50–$13.25
12	27.53– 28.70	23.86– 28.70	22.02– 24.50
10	33.02– 40.10	30.48– 40.10	27.44– 34.23
8	46.09– 56.50	42.54– 48.23	38.99– 41.34
6	91.18– 91.30	61.76– 77.84	52.18– 66.72

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net	
Less than 25 lb.	$37.75	$38.40
25 to 50 lb.	36.40	37.75
50 to 100 lb.	32.40	36.75

CHICAGO

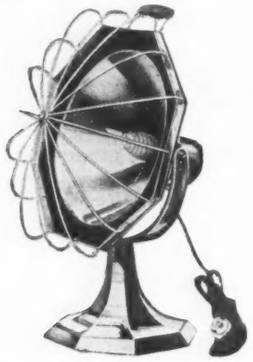
	Per 100 Lb. Net
Less than 25 lb.	$37.00 to $39.72
25 to 50 lb.	36.00 to 38.7
50 to 100 lb.	35.00 to 37.72

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Deep Parabolic Reflector Heating Stove

Full reflection of the heat rays is claimed for a reflector-type radiator that is being manufactured by the Rutenber Electric Company, Marion, Ind. This is accomplished, the maker says,



SWIVEL ALLOWS HEAT TO BE DIRECTED TO ANY ANGLE

by the extra deep parabolic reflector which concentrates the heat rays and the fact that the heating element is placed vertically in the focal plane. This type of radiator has a swivel base so that it can be turned at any angle. Also a hole in the base allows the device to be placed on the side wall where the heat may be reflected in any angle required.

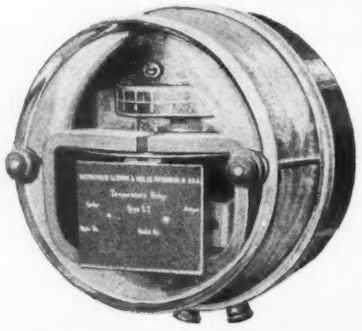
This device is furnished complete with 8 ft. (2.4 m.) of heater cord, feed-through switch and attachment plug which can be used on any lamp socket. The wattage is 615 and the shipping weight is 10⅛ lb. (4.6 kg.)

Temperature Relay for Overload

A relay known as type CT, built by the Westinghouse Electric & Manufacturing Company, is designed so that it will automatically trip the circuit breaker of a power circuit when the temperature reaches a danger point under excessive current. This device may be used to protect any alternating-current apparatus from excessive heating, if the apparatus is so arranged that an exploring coil can be installed.

The relay is intended to protect apparatus against overheating from sustained overloads. To afford this protection with the least interruption of service, the breaker should be tipped through the direct effect of the temperature of the apparatus. The relay should be so arranged that it prevents the breaker from tripping if the overload is of such short duration that the temperature does not rise to a dangerous value, while, if the overload persists, the breaker must be tripped out as soon as the temperature rises beyond the critical value. This is accomplished by an operation similar to the Wheatstone-bridge principle. Two arms of the bridge are copper exploring coils arranged to be placed in the oil or embedded in the windings of the apparatus to be protected. The other two arms are unchanging resistances, mounted in the relay.

The current for the bridge is supplied by the current transformer connected in the circuit of the apparatus to be protected. The relay has two windings, corresponding with and cooperating to produce a torque in a manner similar to the current and voltage coils of a wattmeter. The main winding is a coil operated directly by the current transformer. The auxiliary coils are connected to the Wheatstone-bridge arms as in a galvanometer connection and thus receive current the magnitude and direction of which depend upon the resistance of the search coils. Above a certain temperature the torque of the relay is in the contact direction and below in the opposite direction. It

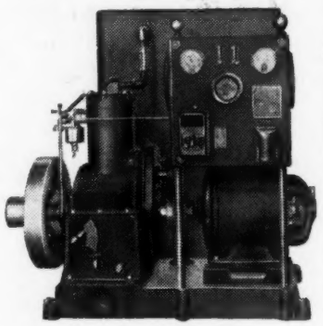


PROTECTS APPARATUS AGAINST OVERHEATING FROM SUSTAINED OVERLOADS

will thus be noted that in order to close the contact two predetermined conditions must co-exist—excess current and excess temperature. Neither one will separately trip the relay.

Farm-Lighting Plant

Longer battery life and the elimination of engine trouble are the two features claimed for an electric lighting plant for farm and country-home use that is being manufactured by the Mayhew Company of Milwaukee, Wis. Other features are said to be simplicity of engine design and effectual control of the charging rate while the batteries are being charged. The engine is of the four-cycle water-cooled type and is rated so that it has considerable surplus power over that required for driving a generator. Therefore a pulley has been



CHARGING RATE CONTROLLED WHILE BATTERIES ARE BEING CHARGED

provided so that the outfit can be used for power purposes as well as lighting.

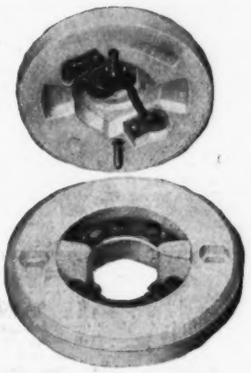
If desired, the outfit may be equipped with a device for automatically shutting down the engine when the batteries are fully charged. The switchboard is provided with a voltmeter, an ammeter and a rheostat for controlling the rate at which the batteries are charged. The generator has been rated at 800 watts, and batteries of various sizes are furnished to meet any conditions encountered in farm and country-home lighting.

Interchangeable Connecting Block and Rosette

It is unnecessary to remove the fitting or splice and solder wires when using a connecting block that has been placed upon the market by the Bryant Electric Company of Bridgeport, Conn. This block, as shown in the accompanying illustration consists of two pieces of porcelain fastened together by means of two screws. These screws are retained by fiber washers in their holes in the top piece even when the two blocks are separated, which eliminates the possible loss of the screws when the block is unassembled. They also form the current-carrying contacts between the top and base.

The base of the block has a substantial recess for the two firmly fixed binding plates, each of which has four binding screws to permit of ready connection of wires for additional circuits as may be needed. This connecting

block can easily be transformed into a rosette by means of a small film or "knock-out" of porcelain in the center of the cap. A light blow will serve to knock this out, transforming the block into a rosette. Wires can be passed through this opening and fastened at the binding screws, as shown in the



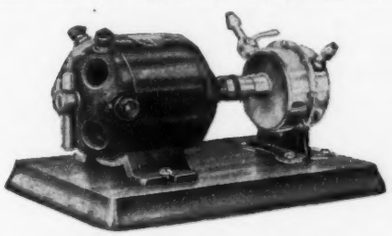
SUBSTANTIAL INTERCHANGEABLE CONNECTING BLOCK

upper view of the figure, so that a drop light or switch fixture can be attached.

Another interchangeable feature of this block is that to this same style of base a porcelain lamp receptacle can be attached. The heavy lugs shown in the base fit into the recesses molded into both the top piece of the block or rosette and the lamp receptacle base and insure the correct relative position of the parts so that the fastening screws, which also serve as current connections, can be easily and properly fastened. These devices, designated as List No. 566 for the rosette connecting block and No. 4122 for the receptacle, are designed for attachment to standard 3¼-in. outlet boxes and to No. 700 Adapti boxes. All of these devices are National Electrical Code approved.

Motor-Driven Rotary Blower

A complete motor-driven rotary blower mounted as a unit on one base is being manufactured by the Anderson Electric Specialty Company, 118



USES SMALL AMOUNT OF ELECTRIC ENERGY

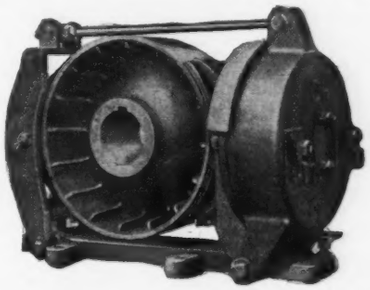
South Clinton Street, Chicago. The device consists of a rotary blower direct-connected to the motor. The energy consumption is said to be only that of a 40-watt lamp, although the blower is driven at a rate of 1500 r.p.m. The driving motor is made in various voltages for either direct or alternating current.

Rapid and Accurate Computer

Simplicity and completeness are the two main features claimed for the Ross rapid computer that is being manufactured by the Computer Manufacturing Company, 25 California Street, San Francisco, Cal. It is so simple, the maker claims, that any one who can read numbers can use this computer. It consists of two dials and a clamped reading arm. When it is desired to multiply or divide, the problem is set under the arm and an arrow automatically points to the answer and another arrow points to the proof. It reads three to four significant figures and is claimed to give an average accuracy of one-twentieth of 1 per cent. It is especially desirable for use on design and construction work because it gives a quick and accurate method of solving otherwise tedious problems.

Magnet-Operated Brake

Simplicity of construction is one of the main features claimed for a magnet-operated brake that is being manufactured by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis. This is accomplished, the maker claims, by lowering the position of the



SMOOTH OPERATION ADAPTS THIS BRAKE TO ELEVATOR OPERATION

magnet and making the magnet armature an integral part of one of the arms carrying the brakeshoes. Fewer parts are required, compactness is secured, and the parts are made extremely strong and rugged without adding excessive weight. The new design requires less head room, as it is but slightly higher than the brake wheel—an important point to be considered when the brake is used on a crane, hoist or bridge.

The brake is applied by means of a spring in the center of the coil, which tends to force the armature and magnet apart. The force acts directly in line with the center of the brakeshoes; thus the operation is not affected by any wear in the brake linkage. The retarding torque exerted on the brake wheel is the same in both directions of rotation. The magnet is of the iron-clad clapper type, working on a very small air gap, which increases the efficiency of this type of magnet. The armature and magnets are both movable and rotate on the same center. This construction reduces the angular movement of all bearings to less than one degree, making the wear negligible, according to the manufacturer. It also eliminates the side friction found in magnets which have the armature mounted on a member extending through the center of the magnet coil.

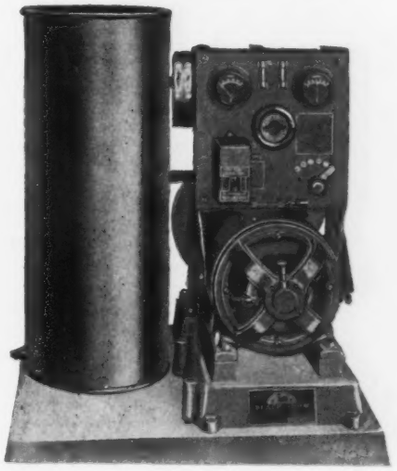
These brakes are manufactured in standard sizes varying from 8 in. to 30 in. (20.3 cm. to 76.2 cm.) in diameter and rated at from 15 hp. to 300 hp.

Electric Sterilizer for Doctors

That it is extremely valuable for medical practitioners is the claim made for the Rentz electric sterilizer that has been placed upon the market by the Santiseptic Manufacturing Company, Inc., Corn Exchange Bank Building, St. George, Staten Island, N. Y. The heating elements in this sterilizer consist of a wire wound over a suitable insulator which surrounds the chamber where the sterilizing is done. The wires are exposed directly to the steam or moisture used in making the superheated steam. The length of the wire used, the area it covers and the fact that it operates at a temperature that seldom exceeds 650 deg. F. (343 deg. C.) makes danger of burn-outs small and reduces maintenance to a minimum. The operation is simple and effective and once heated to operating temperature the sterilization process takes place very rapidly.

Small Electric Light and Power Plant

An electric light and power plant for farms, stores, schools, churches, etc., is being offered to the trade by the Black Swan Company, Waseca, Minn. This plant is furnished with an automobile-type gasoline engine, self-starter, automatic circuit breaker, voltmeter and meter rheostat and 1000-watt gen-



DRIVEN BY AUTOMOBILE-TYPE GASOLINE ENGINE

erator. It is equipped to furnish brilliant light, to operate a washing machine or fanning mill, electric irons, pump water, etc.

Trade Notes

ORDNANCE FLAG FOR WAR PLANTS.—Those plants with an output of which more than 50 per cent is for the government will be allowed, it is reported, to fly a special flag bearing the Ordnance Department insignia.

THE WALTER A. ZELNICKER SUPPLY COMPANY, St. Louis, Mo., recently secured the services of Merle G. Peterson, who is now connected with the company's Chicago sales force at 428 First National Bank Building. Mr. Peterson was formerly associated with the Niles-Bement-Pond Company and the Pratt & Whitney Company.

THE INDUSTRIAL ELECTRIC FURNACE COMPANY, Chicago, maker of the Snyder electric furnace, is installing a 5-ton furnace in the plant of the Zimmerman Steel Company, Bettendorf, Iowa. It is a three-phase furnace, designed for acid operation, and will be used for general work. C. H. Atherton, manager of the Zimmerman Steel Company, ordered the installation to replace the converter which that company had been using.

IMPORTATION OF CREOSOTE OIL.—List of Restricted Imports No. 1 has been so far modified as to permit the importation from Japan of 2,000,000 gal. of creosote oil during the remainder of the present calendar year. Licenses for the importation of this quantity of creosote oil from Japan may be issued during the remainder of the present calendar year when the applications are otherwise in order, with the proviso that such oil is shipped on vessels approved for that purpose by the shipping control committee of the United States Shipping Board. The amount so permitted to come forward will be allocated by the Bureau of Imports of the War Trade Board.

RUBBER IMPORTS IN AUGUST AND SEPTEMBER.—After a study of the situation regarding supplies of crude rubber in this country, rate of consumption and related matters, and after consultation with the War Industries Board, the War Trade Board has decided to permit importation of crude rubber during the months of August and September at the rate tentatively fixed for the quarter ending July 31, 1918, viz., 100,000 tons per annum. The amount of crude rubber to be licensed for importation from overseas during the months of August and September has, therefore, by this ruling of the War Trade Board, been limited to 16,666 tons. This amount will be allocated by the Bureau of Imports of the War Trade Board along the general lines of the previous allocation, certain changes therein having been made to take care of new manufacturers and increased government requirements.

ANOTHER VACUUM CLEANER COMPANY IN PRICE MAINTENANCE WEB.—The Federal Trade Commission has issued complaints against three additional manufacturers believed to be practicing resale price maintenance. The firms are the Enders Sales Company, New York City, in the sale of safety razors; the Vortex Manufacturing Company, Chicago, in the sale of paraffine cups and dishes and metal holders, and the Hoover Suction Sweeper Company of New Berlin, Ohio, in the sale of vacuum cleaners. The Enders and Hoover companies were charged with attempting to force dealers to maintain standard resale prices to the public, and the Vortex company with attempting to force standard resale prices on jobbers and wholesalers handling their products. All were charged with refusing to sell dealers or jobbers who sell at their own prices. The cases will be heard in Washington on Sept. 20, 21 and 23.

CAUTION TO USERS OF WORLD TRADE DIRECTORY.—Through the War Trade Board it has come to the attention of the Bureau of Foreign and Domestic Commerce that American firms have been corresponding with firms in neutral countries whose names appear upon the enemy trading list. It has further appeared that in many instances the names of the enemy firms have been taken from the "World Trade Directory" published by the Department of Commerce and Labor in 1911. Notice is hereby given to all persons and firms who may have in their possession a copy of this directory that no letter should be addressed to any person or firm in a neutral country without a careful examination of the enemy trading list published by the War Trade Board for the purpose of ascertaining whether or not said firms are listed therein. Application for copies of the enemy trading list should be made to the Division of Information, War Trade Board, Washington, D. C.

THE IVANHOE-REGENT WORKS of the General Electric Company, Cleveland, Ohio, make the following announcement: "It has been the custom for manufacturers of industrial lighting equipment, as well as for manufacturers of similar products, to give the best discount to jobbers and distributers without making any distinction in discount between the contractor-dealer and the industrial-plant consumer. The Ivanhoe-Regent Works, however, after a study of the Goodwin plan, has come to agree with Mr. Goodwin that the present organization of the electrical industry is necessary to an economic distribution and merchandising of electrical material, and that all of the units composing the electrical industry—central stations, wholesalers, contractor-dealers—are entitled to recognition and assistance from the manufacturer. Beginning on Aug. 15, 1918, the Ivanhoe-Regent Works puts into effect an arrangement whereby its merchandising and distribution schemes conform to the Goodwin plan. Under this arrangement the jobber and distributer will receive his discount, and the consumer who buys in quantities will also be permitted a discount as before; but the new plan provides a differential discount on Ivanhoe metal reflectors and fittings to the contractor-dealer also."

Trade Publications

BATTERY-CHARGING OUTFIT.—The Electric Products Company, Cleveland, Ohio, has issued a booklet describing and illustrating its line of battery-charging outfits.

METER.—A circular has been issued by the Esterline Company, Indianapolis, Ind., describing and illustrating the new Esterline Model MS graphic recording instruments.

LUGS.—The Benjamin Electric Manufacturing Company, 806 West Washington Street, Chicago, has issued a leaflet reproducing copy of advertisements which it will furnish to the trade.

FARM-LIGHTING PLANT.—The Schroeder Headlight & Generator Company, Evansville, Ind., is distributing a leaflet describing and illustrating its farm-lighting plant. This equipment is known as the "Farm-lite."

REFRIGERATING OUTFITS.—Iceless refrigerating machines are described and illustrated in a booklet that is being distributed by the Sanitary Refrigerating Machine Company, Milwaukee, Wis. Typical installations of these machines are also illustrated.

ELECTRICAL DEVICES.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued a revision of bulletins Nos. 2165, 5120, 5225, 9116, 10,010 and 10,011. These bulletins cover motor starters, controllers, starting switches and pressure regulators.

ELECTRICAL APPLIANCES.—A catalog listing electric ranges, electric hot plates, electric table stoves, electric irons, electric toasters, electric radiators, etc., has been issued by the Rutenber Electric Company of Marion, Ind. The catalog is entitled "Cook the Electric Way."

MOTORS.—Polyphase induction motors are described and illustrated in bulletin No. 2005, dated July 1918, that is being distributed by the Triumph Electric Company, Cincinnati, Ohio. The principle of operation, the construction and applications of these motors are described and illustrated.

REFRIGERATING MACHINES.—"Cold Facts" is the title of a pamphlet that is being distributed by the Peerless Ice Machine Company, 120 Broadway, New York, illustrating an installation of the Peerless automatic refrigerating machine. The advantages of these machines in different stores are told.

ELECTRICAL ADVERTISING MATTER.—The Society for Electrical Development, Inc., United Engineering Societies Building, 29 West Thirty-ninth Street, New York, has issued a circular describing a campaign of conservation for members and non-members. This is the "Saving by Wire" campaign which becomes a patriotic duty and war-time necessity, according to the society, to save fuel, food, time and money in the home.

FARM POWER PLANTS.—Lighting plants of ⅔-kw. and 3-kw. rating are illustrated and specified in a pamphlet called "Delco-Light," which may be obtained from the Domestic Engineering Company, Dayton, Ohio. Each power plant consists of a gasoline-engine-driven generator (32 volts or 110 volts) and a storage battery. A utility motor is also handled by this firm.

SOLDERING IRON.—"Electric Soldering Iron and Hand Tools" is the title of an eight-page envelope folder just issued by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis. This folder shows two views of the soldering iron, which has a threaded heating core over which the tip is screwed. A new automatic rack lately placed upon the market is explained in detail.

POTENTIAL STARTERS.—Potential starters for squirrel-cage induction motors are described and illustrated in a circular that is being distributed by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis. The pamphlet discusses this starter as applied in places where the operator may be unskilled and points out the various features of the device. It is listed as No. 1102.

ELECTRIC FITTINGS.—The Steel City Electric Company, Pittsburgh, Pa., has issued catalog No. 33, describing and illustrating its line of electric fittings. This catalog lists bushings, fixture stems, fixture hangers, marine fixtures and outlet boxes, fish wire, conduit benders, junction boxes, outlet boxes and covers, insulator supports, telephone outlets, floor outlets, attachment plugs and various other fittings used by contractors.

DAYLIGHT MOTION-PICTURE MACHINE.—"The Attractograph—What It Is, What It Does," is the title of a bulletin being distributed by the Attractograph Company, Inc., Candler Building, 220 West Forty-second Street, New York. This bulletin illustrates and describes the automatic daylight motion-picture machine manufactured by this company, and shows front and rear views of the mechanism. It also tells where the machine can be used and its most important advantages.

ELECTRICAL APPLIANCES.—The Hotpoint Division of the Edison Electric Appliance Company, Ontario, Cal., has issued a circular entitled "How to Help the Government with the Conservation Plan." It consists of an attractive advertising folder of the Hotpoint lamp line, giving effective window displays to cultivate business and sales helps, Hotpoint "headlites," full-page advertisements, a profit-making scheme, newspaper advertisements, copy and cuts, reproduction of Hotpoint "ads," and household hints from the *Ladies' Home Journal*.

New Incorporations

THE VENEDOCIA (OHIO) ELECTRIC LIGHT COMPANY has been incorporated with a capital stock of $5,000 by David Davis and others.

THE FAWN TOWNSHIP LIGHT & POWER COMPANY of New Park, Pa., has been chartered, with a capital stock of $20,000, by H. M. Anderson and others.

THE BOERNE LIGHT & ICE COMPANY, Boerne, Tex., has been incorporated with a capital stock of $10,000. The incorporators are J. J. North, Alfred Pfaendler and L. H. Bowden.

THE DOWNINGTON ELECTRIC LIGHT & POWER COMPANY of Philadelphia, Pa., has been incorporated with a capital stock of $5,000 to construct and operate an electric-lighting plant. J. E. Aimmerman is interested in the company.

THE SUBURBAN LIGHTING CORPORATION of Norfolk, Va., has been chartered with a capital stock of $10,000 by E. H. Danforth and R. E. Trant. The company proposes to manufacture and deal in lighting fixtures, etc.

THE AUSABLE FORKS (N. Y.) ELECTRIC COMPANY has been incorporated by J. Rogers, G. Chahoon and M. Sheffield of Ausable Forks. The company is capitalized at $25,000 and proposes to generate and distribute electricity for lamps, heaters and motors.

THE HOUGH MANUFACTURING & SALES COMPANY files notice of authorization to operate a plant at 512A Bergen Avenue, Jersey City, N. J., for the manufacture of electrical and gas appliances. John A. Hough, 15 Lexington Avenue, heads the company.

New England States

FARMINGTON, ME.—Plans are under consideration by the Franklin Power Company, Inc., for the early construction of a new local hydroelectric power plant, about 25 ft. by 45 ft. George E. Farnham, Monmouth, is architect.

LEWISTON, ME.—The power plant of the Androscoggin Electric Company at Deer Rips was badly damaged by fire, caused by lightning, on Aug. 9.

AMHERST, MASS.—The Massachusetts Agricultural College has awarded a contract to Allen Brothers, Amherst, for the construction of the proposed new turbine plant and coal-handling works at the institution. The work is estimated to cost about $55,000.

BOSTON, MASS.—The Edison Electric Illuminating Company of Boston and the New England Power Company of Worcester have petitioned the Board of Gas and Electric Light Commissioners for permission to make the necessary extensions and connections so that electricity can be interchanged between the two companies. The proposed line for such interconnection will extend into or through the city of Boston and the towns of Dedham, Westwood, Dover, Natick, Sherborn, Framingham and Southboro.

BROCKTON, MASS.—Preliminary plans are being prepared for the construction of a new power plant at the local works of the Walk-Over Shoe Company. Jenks & Ballou, 753 Grosvenor Building, Providence, R. I., are engineers.

DEERFIELD, MASS.—Plans have been filed by the Boston & Maine Railroad Company, Boston, for the erection of a new local one-story engine plant. The structure is estimated to cost $75,000. Contract has been awarded to the H. Wales Lines Company, 134 State Street, Meriden, Conn.

HAVERHILL, MASS.—Notice has been filed with the Commissioner of Corporations of an increase of $175,000 in the capital stock of the Haverhill Electric Company, bringing the total capital to $945,000.

UXBRIDGE, MASS.—Plans have been prepared for the erection of an addition to the steam power plant of the New England Power Company at Uxbridge. The Harry Hope Engineering Company, 185 Devonshire Street, Boston, has charge of the engineering work.

WORCESTER, MASS.—The Worcester Electric Light Company has petitioned the Board of Aldermen for permission to place conduits in Belmont, Grafton and Jackson Streets.

Middle Atlantic States

BUFFALO, N. Y.—The City Council has approved the resolution calling for the installation of the proposed new flashlight police signal system in different sections of the city. Plans will be prepared at once.

BUFFALO, N. Y.—Plans have been prepared by the Niagara Electro Chemical Company, 2700 Buffalo Avenue, Niagara Falls, for the erection of two-story addition, 38 ft. by 251 ft., to its plant at Buffalo Avenue and the Connecting Terminal Railroad.

BUFFALO, N. Y.—The Pierce-Arrow Motor Car Company of Buffalo has awarded a general contract for addition to its power house, 43 ft. by 53 ft., at Elmwood Avenue and the New York Central Railroad to the Stone & Webster Engineering Corporation, Boston, Mass., to cost with equipment about $300,000. The company will also erect a testing building, 50 ft. by 100 ft.

GARDENVILLE, N. Y.—Work has begun on the construction of the new engine terminal at the local yards of the Pennsylvania Railroad Company. The proposed plant will cost about $700,000 and will consist of an engine house with a capacity for twenty-four locomotives, machine shop, with turntable and other buildings.

GENEVA, N. Y.—Contract has been awarded by the United States Lens Company of Geneva to J. J. Prindeville, Framingham, Mass., for the construction of a new one-story plant, 105 ft. by 180 ft., on Lyceum Street, to cost about $50,000. The company is also considering the erection of a new power plant for which plans are now being prepared. A. T. Wilson is president.

MECHANICSVILLE N. Y.—The J. Livingston Company, 70 East Forty-fifth Street, New York, has been awarded the contract for all electrical work in connection with the construction of the new plant of the West Virginia Pulp & Paper Company. The project will consist of eight large manufacturing units, with auxiliary buildings, to cost about $350,000.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEW YORK, N. Y.—Contract has been awarded to the A. B. See Electric Elevator Company, 220 Broadway, for the installation of electric elevators in the proposed new Assay Building to be constructed at 30 Wall Street at $19,150. The entire structure will cost about $585,000.

NEW YORK, N. Y.—Bids will be received until Aug. 29 by the Commission of New Prisons, Hall of Records, in connection with extensive improvements to be made at Sing Sing Prison, Ossining, for work as follows: Additions to the central heating plant, including underground piping and the installation of conduits at Detention Building No. 5, Clinic Building No. 8; the installation of a new underground electric conduit and feeder system and pump house, same building, and improvements in the water supply system, Detention Building No. 5, Clinic Building No. 8. Lewis F. Pilcher, Capitol Building, Albany, State Architect.

PHOENIX, N. Y.—Plans are under consideration by the John Dunlop Sons Company, 254 Fifth Avenue, New York, for the erection of a new one-story power house, 50 ft. by 50 ft., in connection with the proposed silk mill in Phoenix.

SCHENECTADY, N. Y.—The General Electric Company, it is reported, is planning to build a large power plant in the extreme northern part of Salisbury. Land for this purpose, it is said, will be acquired in the towns of Salisbury, Ohio, Fairfield and Norway. The government is said to be back of the entire project, the development and utilization of water power being considered a war measure.

SYLVAN BEACH, N. Y.—The Public Service Commission has granted William V. Cottman permission to operate an electric lighting plant at Verona Beach and Sylvan Beach on Oneida Lake, under franchises given by the town authorities. The Sylvan Beach Electric Light & Power Company formerly supplied electricity for lighting the Oneida Lake resorts. It discontinued business in 1912, and since then these places have been without electric service.

SYRACUSE, N. Y.—To aid in the conservation of fuel, and in compliance with the recent orders of the Fuel Administration, the City Council is planning to reduce the service in the ornamental electric street-lighting system. The city officials have rejected the bid recently submitted by the Syracuse Lighting Company for street lighting.

UTICA, N. Y.—Plans have been filed by the Utica Gas & Electric Company for the erection of an addition to its plant. Contract for the building has been awarded to the Kimberly Construction Company of Utica.

BEDMINSTER, N. J.—Plans are under consideration by the Township Committee for improvements to the electric street-lighting system.

BROWN MILLS, N. J.—The Board of Public Utility Commissioners has granted permission to the Brown Mills Electric Light & Power Company to issue bonds for $17,000 for extensions and improvements to its system.

CALDWELL, N. J.—Plans are under consideration for the installation of a new electric street-lighting system in connection with the development by the War Department of the new rifle range at Great Piece Meadow.

DOVER, N. J.—Arrangements are being made by the New Jersey Power & Light Company for furnishing the International High Speed Steel Company of Rockaway with 20,000 hp. additional per month to operate its plant. At the present time a total of 150,000 kw.-hr. per month is required by the company.

DOVER, N. J.—Plans have been filed by Paul Guenther, Inc., 69 King Street, manufacturer of hosiery and knit goods, for improvements and alterations in the power plant at the works. Contract has been awarded to J. J. O'Leary, 500 Bloomfield Avenue, Passaic, N. J.

DOVER, N. J.—Contract has been awarded the New Jersey Power & Light Company by the Wharton Steel Company for supplying power for the operation of additional equipment recently installed in its Scrub Oak iron ore mines, including a new 350-hp. compressor. A new 11,000-volt transmission line has just been completed extending to the plant of the Atlas Powder Company at Landing.

HARRISON, N. J.—The Crucible Steel Company of America, South Fourth Street, is planning to commence work on the construction of a new one-story gas producer works, about 80 ft. by 180 ft., at its plant. The structure is estimated to cost about $80,000. Contract has been awarded to W. H. & F. W. Cane, Woolworth Building, New York.

HOBOKEN, N. J.—Contract has been awarded by the United States government to the F. G. Fearson Company, 280 Madison Avenue, New York, for the construction of a new power house in Hoboken, to cost about $19,400.

NEWARK, N. J.—The Sundh Electric Company, 51 East Forty-second Street, New York, N. Y., has increased its capital stock from $120,000 to $170,000. The company manufactures electric controlling devices. Its plant is on Parkhurst Avenue, Newark, N. J.

NEWARK, N. J.—The Maas & Waldstein Company, 437 Riverside Avenue, has awarded a contract for the construction of a large new brick one-story boiler plant at its works to Henry M. Doremus Company, 36 Orange Street. The structure will cost approximately $50,000. The company will also erect a radial brick stack for the plant, to cost about $9,000.

POMPTON LAKES, N. J.—In connection with the construction of the proposed new addition to the municipal hydroelectric plant, the Borough Council has awarded the contract for the structure to Fred Kilgus, Inc., 13 South Sixth Street, Newark, at a cost of $31,406. Immediately upon completion of the structure, the necessary equipment will be installed, bids for which have been received as follows: Hydraulic Turbine Company, Camden, N. Y., turbines, $7,065; S. Morgan Smith Company, York, Pa., electric generators, $10,000; General Electric Company, New York, electrical apparatus, switchboard, etc., $9,948.

TRENTON, N. J.—The Department of Architecture, State House, will receive bids until Aug. 28 for the construction of a new radial brick stack at the State Home for Boys, Jamesburg. Francis H. Bent, State Architect.

TRENTON, N. J.—Bids will be received by the Mercer County Board of Freeholders, Trenton, until Aug. 27 for the installation of two electric motors, wiring, etc., for operating the drawbridge on Southard Street across the Delaware & Raritan Canal, Trenton. John McCullough is director of department of bridges.

HARRISBURG, PA.—Permission has been granted by the Public Service Commission for the issuance of bonds and securities for improvements and extensions to the following companies: The Metropolitan Edison Electric Company of Reading, $3,400,000; the Lancaster (Pa.) Light, Heat & Power Company, $105,650; the Edison Electric Company of Lancaster, $77,500; the Beaver County Light Company of Beaver Falls, $96,500.

LANCASTER, PA.—Notice has been filed with the Public Service Commission by the Edison Electric Company of the issue of capital stock for $77,500, to provide for expansion.

NICETOWN, PA.—Plans have been filed and contract awarded to Barcley, White & Company, 1713 Sansom Street, Philadelphia, for the construction of additions to the local gun-maufacturing plant of the Midvale Steel & Ordnance Corporation, Widener Building, Philadelphia. The work includes the erection of a new electric generating station, about 55 ft. by 120 ft. The cost of the entire work is estimated at about $750,000.

PHILADELPHIA, PA.—Plans have been filed by the George W. Smith Company, Forty-ninth Street and Botanic Avenue, for the erection of new boiler plant at its works. Contract for the structure has been awarded.

PHILADELPHIA, PA.—Plans have been prepared by the Bureau of Yards and Docks, Navy Department, for the erection of a submarine battery building, 90 ft. by 340 ft., at the local navy yard, to cost about $125,000.

PITCAIRN PA.—Contract has been awarded by the Pennsylvania Railroad Company to Irwin & Leighton, 126 North Twelfth Street, Philadelphia, for the construction of new shop buildings at Pitcairn. The cost with equipment is estimated at about $1,000,000 and will include a machine shop, engine house with a capacity of thirty-four locomotives, ice house and other buildings.

PITTSBURGH, PA.—A permit has been granted the Westinghouse Electric & Manufacturing Company for the construction of an addition to its plant on Amberson Avenue in the Shadyside section.

PITTSBURGH, PA.—The Beaver County Light Company has recently filed notice with the Public Service Commission of the issuance of bonds to the amount of $96,500, the proceeds to be used in part for extensions and improvements.

PITTSBURGH, PA.—Contract has been awarded by the Pennsylvania Chocolate Company to the Turner Construction Company, 11 Broadway, New York, N. Y., for the construction of an addition to its power plant, 50 ft. by 75 ft. Work has begun on the building.

PITTSBURGH, PA.—The Duquesne Light Company, operating power plants in the principal sections of Allegheny and Beaver Counties, is planning for extensive improvements and alterations in its plants and system. The company has completed arrangements for the issue of three-year 6 per cent gold notes for $10,000,000, a portion of this fund to be used for the contemplated work.

PITTSBURGH, PA.—An agreement has been reached between the United States government and the West Penn Power Company whereby the latter will build a 40,000-kw. power station at the mouth of a coal mine in the Allegheny Valley and connect it up by a transmission system with the distribution system of Pittsburgh. The cost of the proposed plant and transmission line is estimated at $5,000,000. The Ordnance Bureau will advance $2,000,000 of this amount, and the company will provide the other $3,000,000. At a period of three years after the war the reduplication cost of the plant is to be determined by three disinterested appraisers. The company undertakes to repay to the government such part of the advance made by the government as represents the excess of the appraised value over the $3,000,000 originally put up by the company.

BLUEFIELD, W. VA.—The Norfolk & Western Railway Company is contemplating the installation of a motor-generator set at its local works. J. E. Crawford of Roanoke is chief engineer.

MOOREFIELD, W. VA.—Plans are being prepared for extensions and improvements to the municipal electric lighting plant.

WYATT, W. VA.—Plans are under consideration by the Consolidated Coal Company for the construction of a new electric power plant at its works for operation.

PORTSMOUTH, VA.—Contract has been awarded by the Bureau of Housing, Department of Labor, Washington, D. C., to the Hegaman & Harris Company, New York, N. Y., to develop an industrial city in the section known as Villa Heights and Paradise Creek, about 3 miles from Portsmouth. The plans call for about 1000 buildings, including 800 dwellings, community buildings, stores, two schools, police and fire department, hospital, churches, electric power plant, etc. George B. Post & Sons, 101 Park Avenue, New York, N. Y., are architects.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 26, under Specification 3244, for extension to boiler-plant building at Washington. The cost of the work is estimated at about $160,000.

WASHINGTON, D. C.—To meet the needs for electric power in shipyards, munition and other war factories, a bill approved by the War Industries Board has been introduced to Congress authorizing the President to construct power plants to meet the immediate demands at Pittsburgh, Philadelphia, New Jersey cities and other Eastern industrial centres. The bill also would authorize the President to take over privately owned power plants, increase their capacity, or to require the owners to place all or part of their power at the disposal of the government. The bill includes an appropriation of $200,000,000 for construction, acquisition, maintenance and operation of such plants.

North Central States

REPUBLIC, MICH.—The Cleveland-Cliffs Iron Company is planning for the construction of a new local substation at its properties for the operation of mining machinery, etc. The company will build a transmission line from its hydroelectric power plant to the new substation, and it is planned to commence immediate construction of this line. The company is now building a new hydroelectric power station on the Dead River, making the third such plant to be operated.

CINCINNATI, OHIO.—Contract has been awarded by the Huenfeld Company of Cincinnati for an addition to its power plant. New automatic stokers, boilers, etc., will be installed. Charles E. Pfau is secretary.

CLEVELAND, OHIO—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, until Aug. 30 for soot blowers for the division of light and heat.

CLEVELAND, OHIO.—Bids will be received at the office of commissioner of purchases and supplies, City Hall, Cleveland, until Aug. 30 for boiler house at the garbage plant, Willow, Ohio. Specifications may be obtained at the office of the city architect.

DAYTON, OHIO.—Plans, it is reported, are being prepared for a large addition to the power plant of the Dayton Power & Light Company.

CENTRAL CITY, KY.—The Illinois Central Railroad Company is contemplating the erection of new buildings at Central City, to cost about $150,000, including a machine shop, power plant, engine house with capacity for twelve locomotives and a 85-ft. turntable.

STITHTON, KY.—John Griffith & Son of Chicago, Ill., have been awarded a large section of the general contract for the construction of the new artillery cantonment at Stithton and, it is reported, will sublet heating, lighting and plumbing contract. Waterworks are to be installed and also a refrigerating plant erected. The cost of the cantonment is estimated at $15,000,000.

MILWAUKEE, WIS.—Contract has been awarded by the Universal Machinery Company, 784 Thirtieth Street, Milwaukee, to the Lakeside Bridge & Steel Company of North Milwaukee, for structural steel for the new power plant of its new foundry and machine shop at Sixty-fourth Avenue, West Allis. Contract will soon be awarded for the machine shop. Frank E. Gray and Val. A. Siebert are associated architects.

RACINE, WIS.—The Board of County Supervisors has authorized the board of trustees of the county asylum to purchase two new 150-hp. water-tube boilers and to erect a 125-ft. smokestack, to cost approximately $14,000.

COUNCIL BLUFFS, IOWA.—The Chicago, Rock Island & Pacific Railroad Company of Chicago, Ill., is planning to erect a one-story power plant, 40 ft. by 60 ft., at its local yards.

RICH HILL, MO.—Contract has been awarded by the city to the Merkle Machinery Company, Interstate Building, Kansas City, for alterations and improvements in the municipal electric plant and waterworks to cost $11,000.

SPRINGFIELD, MO.—Plans, it is reported, are being prepared by Sanderson & Porter, engineers, 52 William Street, New York, N. Y. and for the construction of a new power plant for the Springfield Gas & Electric Company.

PIERRE, S. D.—Bonds to the amount of $100,000 have been voted to rebuild the water and electric light plant recently destroyed by fire.

Southern States

GASTONIA, N. C.—In connection with the erection of a new plant to provide for increased capacity, the Parkdale Mills are arranging for the installation of electrically operated machinery.

GREENSBORO, N. C.—Plans have been filed by the Agricultural & Technical College for extensions in the heating plant at the institution. Contract for the work, which is estimated to cost about $55,000, has been awarded to B. MacKenzie, Greensboro.

ROARING RIVER, N. C.—The Blue Ridge Mill Company, recently organized, is contemplating a small hydroelectric development to supply power to operate its proposed grist mills. L. J. Salmon is president.

CHESTERFIELD, S. C.—Plans are being considered by the Chiquola Mills for the installation of electric lighting, sewer and water systems for the mill village.

THOMASVILLE, S. C.—The Ragan Knitting Company is planning for the installation of electrical equipment for operation in the proposed new plant to be erected at a cost of about $25,000.

MONTICELLO, FLA.—Bonds to the amount of $17,500, it is reported, have been voted for the installation of an electric light and power plant in Monticello.

WAUCHULA, FLA.—Bonds to the amount of $24,000 have been issued to acquire the local electric light plant. Of the proceeds $4,000 will be used for the purchase of new equipment.

LITTLE ROCK, ARK.—Bids will be received by Charles E. Taylor, Mayor, at the office of John P. Almand, architect, 1105 Boyle Building, Little Rock, until Aug. 29 for the construction of a four-story and basement building, to be known as the Logan H. Roots Memorial Hospital, City Hospital of the city of Little Rock, including general contract, plumbing and sewerage, heating, electric wiring and vacuum cleaning.

GALVESTON, TEX.—The Navy Department is contemplating the installation of an electric lighting system in connection with the airplane training base on Galveston Bay. The cost of the entire project is estimated at $2,000,000. L. B. Hyde, engineer, U. S. N., is in charge.

Pacific and Mountain States

SEATTLE, WASH.—The contract for the construction of the new wireless plant of the Kilbourne & Clarke Manufacturing Company of Seattle has been awarded to Fred Woodman of this city. Bids will soon be asked for electrical work, heating and plumbing.

SEATTLE, WASH.—The Capital Issues Committee has demanded that the plants of the city and the Puget Sound Traction, Light & Powder Company be connected so that surplus power of either plant could be used, which the officials of both the city and company have agreed to.

TACOMA, WASH.—Steps are being taken by the Mayor and City Council for the acquirement of the Lake Cushman power site, to provide for the future needs of the city's industrial and residential development. No immediate development of the power site is contemplated.

SAN FRANCISCO, CAL.—The Western States Gas & Electric Company of San Francisco is considering the construction of a hydroelectric power plant near Twin Lakes, to cost about $1,000,000.

DENVER, COL.—Bids will be received by the United States Reclamation Service, Denver, until Oct. 1 for furnishing a 5000-kw. vertical hydraulic turbine and generator. For particulars address the United States Reclamation Service, Washington, D. C., or Denver, Col.

Canada

PRINCE RUPERT, B. C.—The Prince Rupert Hydroelectric Company is contemplating the construction of a hydroelectric plant, to cost about $100,000. P. Lorenzen is engineer.

SQUAMISH, B. C.—Work will commence in the near future on a hydroelectric plant for the provincial government, Department of Railways. W. T. Oliver, Minister.

BRANTFORD, ONT.—P. H. Secord & Company, Ltd., 133 Nelson Street, has been awarded the contract for the boiler house for the Waterous Engine Works Company, Ltd., to cost $16,000.

FORT WILLIAM, ONT.—The erection of a $5,000 concrete substation is contemplated by N. M. Peterson & Co.

NORTH BAY, ONT.—Bids will shortly be called for the erection of a $10,000 pumping station for the town council. H. McAusland, engineer.

PORT ARTHUR, ONT.—Construction work on the Nipegon Power Development at Cameron Falls has begun.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing agent, the Panama Canal, Washington, D. C., until Aug. 26 for steel and copper wire and cable, friction shaper, tool grinder, etc. Blanks and further information may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 606 Common Street, New Orleans, La., and Fort Mason, San Francisco, Cal.

1,272,402. ELECTROMAGNETIC SWITCHING DEVICE; Henry C. Egerton, Passaic, N. J. App. filed Oct. 10, 1917. The operation of which may be retarded or delayed for a predetermined period.

1,272,405. VOLUME-MANGANESE DEPOLARIZING MATERIAL; Carleton Ellis, Montclair, N. J. App. filed Oct. 23, 1915. Non-hydrating and does not expand to any extent in the presence of water.

1,272,407. NON-CONDUCTING MANGANESE DEPOLARIZING ELECTRODE; Carleton Ellis, Montclair, N. J. App. filed Oct. 18, 1915. Suitable for Leclanché type cell.

1,272,410. ALTERNATING-CURRENT RELAY; Oscar S. Field, New York, N. Y. App filed Jan. 3, 1917. Employs a hollow non-magnetic cup rotor in its operation.

1,272,413. TELEPHONE MOUTHPIECE; Melvin C. Fredrickson, Cameron, Wis. App. filed June 13, 1917. A sanitary mouthpiece of inexpensive construction.

1,272,418. ELECTRIC ARC LAMP; Joseph Gelb, New York, N. Y. App. filed June 29, 1916. For photographic work or for projecting work.

1,272,420. TURBO END BELL; Ralph E. Gilman, Pittsburgh, Pa. App. filed March 4, 1915. In which the heating caused by magnetic conditions with the dynamo-electric machine is reduced to a minimum.

1,272,432 RELAY; Clarence B. Harlow, Chicago, Ill. App. filed Aug. 28, 1917. Telephone signaling relays intended particularly for transferring a subscriber's call from the telephone line to a high-tension line.

1,272,433. CARBURETOR ATTACHMENT; Linn B. Harrod, Little Rock, Ark. App. filed Dec. 7, 1917. Relates to means for heating the air coming through the air intake of a carburetor.

1,272,444. SYSTEM FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY; John S. Holliday, Wilkinsburg, Pa. App. filed Dec. 18, 1914. The transmission line is divided into sections; when the line is to be energized, power is first applied to one section only.

1,272,445. CIRCUIT-CONTROLLING DEVICE; John S. Holliday, Wilkinsburg, Pa. App. filed Dec. 18, 1914. For systems for the transmission and distribution of electrical energy.

1,272,446. SLOW-ACTING SECTIONALIZING DEVICE; Harry M. Jacobs, Schenectady, N. Y. App. filed Feb. 17, 1915. Transmission line may be gradually energized in such manner that the starting power is not much greater than the normal load.

1,272,447. SYSTEM FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY; Harry M. Jacobs, Schenectady, N. Y. App. filed Feb. 17, 1915. Relates particularly to sectionalized transmission lines.

1,272,463. DISTRIBUTION SYSTEM FOR VAPOR ELECTRIC APPARATUS; Charles A. Kraus and Roy D. Maily, Lynn, Mass. App. filed Aug. 27, 1909. The operation of such apparatus is safeguarded against the short-circuiting.

1,272,469. ELECTROTHERAPEUTIC INSTRUMENT; Tiodolf Lidberg, Chicago, Ill. App. filed Dec. 18, 1916. To maintain constant temperature, preferably below that required to cauterize.

1,272,548. SHIELDING SYSTEM FOR VAPOR CONVERTERS; Edmund F. Sipher, Wilkinsburg, Pa. App. filed Aug. 28, 1915. Will insure a uniform distribution of the power arc over all portions of the anode.

1,272,621. SHIELDING SYSTEM FOR VAPOR CONVERTERS; Lewis W. Chubb, Edgewood Park, Pa. App. filed Aug. 9, 1915. The arc shall be restricted to certain well-defined portions of the anode.

1,272,624. TELEPHONE-EXCHANGE SYSTEM; Roy D. Conway, Chatham, N. J. App. filed March 21, 1917. Ringing on a called line starts almost immediately upon the connection of the link circuit therewith.

1,272,632. METHOD OF STARTING THREE-PHASE, THREE-WIRE ROTARY CONVERTERS; Walter M. Dann, Wilkinsburg, and Harold H. Rudd, Edgewood, Pa. App. filed April 12, 1915. For starting a rotary converter from its alternating-current side.

1,272,637. BRUSH UNIT; Albert E. Doman, Elbridge, N. Y. App. filed June 8, 1916. A one piece brush-carrying unit of molded insulating material.

1,272,641. TELEPHONE SYSTEM; Henry C. Egerton, Passaic, N. J. App. filed July 24, 1916. Relates to paging or announcing systems.

1,272,673. SERVICE-OBSERVING CIRCUIT FOR TELEPHONE LINES; Charles W. Keckler, Newark, N. J. App. filed April 14, 1915. Adapted to be associated with a subscriber's line.

Record of Electrical Patents

Notes on United States Patents

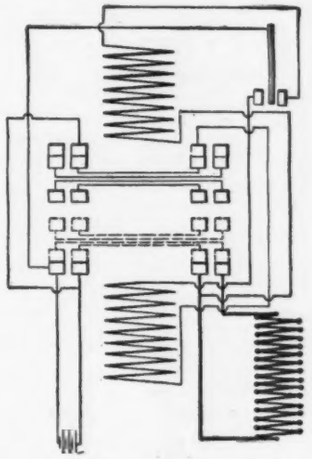
1,272,677. OIL SWITCHBOARD; Hubert Krantz, Brooklyn, N. Y. App. filed May 19, 1913. In which the current is of such magnitude as to necessitate the breaking of the electrical circuits.

1,272,689. TELEPHONE-EXCHANGE SYSTEM; Harry W. MacDougall, East Orange, N. J. App. filed July 2, 1917. In which ringing current is automatically applied to a wanted line.

1,272,692. TRANSMITTING SUPPORT; George E. Mather, East Orange, N. J., and Bertram Baily, New York, N. Y. App. filed March 2, 1917. Applicable to transmitters mounted on chest plates and supported on the body of the user.

1,272,693. RETAINING MEANS; Emil Mattman, Wilkinsburg, Pa. App. filed Jan 24, 1914. To provide means for firmly holding transformers in their casings.

1,272,700. METALLIC JOINT AND PROCESS OF MAKING THE SAME; Harold A. Newcomb Wilkinsburg, Pa. App. filed Oct. 2, 1914. The materials of which they are composed cannot readily be united by ordinary methods, such as soldering.



1,273,188—Electric Switch

1,272,714. CONNECTOR FOR OUTLET BOXES; Peter Reinhalter, Wilkes-Barre, Pa. App. filed Jan. 4, 1915. Adapted to receive the conductor, and novel means for locking said body portion with respect to the conductor.

1,272,719. PROTECTING CASING FOR ELECTRICAL CONDUCTORS; Henry L. Rooke, Jr., Houston, Tex. App. filed May 1, 1917. For surrounding the commutator of an internal-combustion motor and protecting the terminals thereof.

1,272,781. PORTABLE ELECTRIC LIGHT; John T. Drufa, Longmeadow, Mass. App. filed April 4, 1918. To be lighted by the manual movement of a slide applied upon the exterior casing.

1,272,782. DRIP-PAN ALARM; Patrick F. Duffy, Newburyport, Mass. App. filed Oct. 16, 1916. For attaching to the drip pan of a refrigerator whereby the signal bell will be sounded when the water reaches a predetermined height.

1,272,783. TROLLEY SPLICER; Frank T. Elwell, Los Angeles, Cal. App. filed Dec. 2, 1916. The ends of the wire can be overlapped and an equal gripping tension placed on each of the ends.

1,272,808. TRENCH FLASHLIGHT; Arnost Janovsky, Brooklyn, N. Y. App. filed Sept. 11, 1917. Special means are provided to prevent any of the light rays from being cast upward.

1,272,843. COMBINED SOUND REPRODUCER AND LIGHTING FIXTURE; Herman G. Pape, New York, N. Y. App. filed Dec. 17, 1914. Adapted for use in auditoriums, churches, theaters, railroad depots, etc.

1,272,844. ELECTRIC RAILWAY SYSTEM; Erich J. Patelski, Chicago, Ill. App. filed March 8, 1915. Arrangement for supplying the current without the necessity of employing either third-rail or trolley wires.

1,272,868. RETAINER FOR ACTIVE MATERIAL OF STORAGE-BATTERY ELECTRODES; James M. Skinner, Philadelphia, Pa. App. filed April 19, 1917. Will cause a material increase in the life of the positive plates.

1,272,869. CIGAR LIGHTER; Maximilian H. Spielman, New York, N. Y. App. filed May 5, 1916. Supplied with an electrical current through a flexible cable running in and out from a reel.

1,272,874. TELAUTOGRAPHIC APPARATUS; George S. Tiffany, Summit, N. J. App. filed Feb. 24, 1912. Relates particularly to telautographs of the variable-current strength type.

1,272,879. ELECTRIC CIRCUIT-CONTROLLING MECHANISM; Julius B. Wantz, Chicago, Ill. App. filed June 4, 1914. Applies particularly to controlling the circuit which supplies current to an X-ray tube.

1,272,893. HEADLIGHT SWITCH FOR AUTOMOBILES; Harvey E. Bawtinheimer, Red Deer, Alberta, Canada. App. filed July 21, 1917. Electrically connected with a magneto and with lamps for maintaining uniform brilliancy of the lamp lights.

1,272,930. MOTOR VEHICLE; Justus B. Entz, Cleveland, Ohio. App. filed April 3, 1913. Relates to driving or propelling mechanism of the type including the so-called electric transmission.

1,272,941. SWITCH; Charles E. Godley, Detroit, Mich. App. filed Dec. 30, 1916. May be closed and opened by successive actuations of a reciprocating plunger or button.

1,272,952. ELECTRIC BATTERY DEPOLARIZER; Major E. Holmes, Lakewood, Ohio. App. filed Jan. 7, 1918. Materials that have marked advantages over present depolarizers.

1,272,973. RELAY; Samuel M. Lucas, Pittsburgh, Pa. App. filed Feb. 14, 1917. The contacts are controlled by a centrifugal device which in turn is operated by a motor.

1,272,993. SPEAKING AND SIGNALING APPARATUS; Herman G. Pape, New York, N. Y. App. filed Dec. 26, 1914. Adapted for use in closed-body vehicles such as limousines, taxicabs, etc.

1,273,000. ELECTRIC BATTERY; Lloyd R. Rhoades, Fremont, Ohio. App. filed Jan. 5, 1916. Relates to bibulous linings for so-called dry cells.

1,273,015. ELECTRIC INSULATOR; Percy M. Thomas, Upper Montclair, N. J. App. filed Aug. 29, 1913. Adapted for high-tension electric lines.

1,273,027. LEVEL; Paul Budde, Bethalto, Ill. App. filed Jan. 26, 1918. Means for illuminating a level which may be otherwise of the standard type.

1,273,045. RELAY SWITCH; Louis W. Downes and Walter S. Mayer, Providence, R. I. App. filed Sept. 30, 1915. To either open or close an auxiliary circuit when an overload or other abnormal condition occurs.

1,273,050. PROCESS OF MAKING COMBUSTION GAS; Clide F. Euler, Topeka, Kan. App. filed April 4, 1916. The production by the aid of electrolytic decomposition, of a gas suitable for use as a combustible.

1,273,056. ELECTRICAL CONNECTION; John H. George, Bridgeport, Conn. App. filed Jan. 12, 1916. A simple and effective means for connecting conductors.

1,273,092. CIRCUIT-CONTROLLING DEVICE; Cleveland Redfield, Ogden, Utah. App. filed Aug. 10, 1916. A means for controlling alternating-current circuits with the maintenance of the power factor.

1,273,101. OVERLOAD APPARATUS; Jay H. Hall, Cleveland, Ohio. App. filed May 2, 1914. Having adjustments for causing the overload device to operate at different values of current.

1,273,102. ELECTRIC RECORDING AND INTEGRATING DEVICE; Paul M. Lincoln, Pittsburgh, Pa. App. filed July 27, 1915. A slow-responding electric measuring device in order to get an integration of the quantity under measurement.

1,273,107. SOUND-TRANSMITTING APPARATUS; Frank Stevens, Philadelphia, Pa. App. filed Jan. 17, 1917. Means for transmitting all sounds, vocal, instrumental, etc.

14,492 (Reissue). SELF-ACTUATING SAFETY PANEL; Hubert F. Krantz, Brooklyn, N. Y. App. filed Nov. 27, 1917. To afford more convenient access for purposes of inspection and replacement of safety fuses.

1,273,126. ELECTRICAL MEASURING INSTRUMENT; William Anthony, Clyde, Ohio. App. filed Sept. 5, 1916. Body frame and the coil and needle holding spool made in two separate pieces.

1,273,151. ELECTRICAL CUT-OUT; Robert C. Cole, Hartford, Conn. App. filed Oct. 3, 1917. Cheap to manufacture and assemble and is so constructed that the fusible link is readily renewable.

1,273,154. RELAY, SELECTING CIRCUIT FOR ARTIFICIAL LINES; Charles S. Demarest, Flatbush, N. Y. App. filed June 15, 1917. For automatically selecting a suitable artificial line or network for balancing a line or trunk with which a repeater is temporarily associated.

1,273,158. HEAT-COIL PROTECTIVE DEVICE FOR ELECTRIC CIRCUITS; Lewis E. Dickinson, Boonton, N. J. App. filed Sept. 17, 1915. Improved heating element which affects the functioning of devices.

1,273,167. MEASURING INSTRUMENT; Harry A. Ewen, London, England. App. filed June 28, 1917. Of the type which depend for their action upon the expansion of a body under the influence of heat.

1,273,188. ELECTRIC SWITCH; Will R. Savage, Omaha, Neb. App. filed April 10, 1915. Adapted to be operated by a direct or an alternating current and equipped with solenoids capable of exerting a heavy pull and arranged to be momentarily energized to prevent heating of coils.

1,273,189. TELEPHONE SYSTEM WITH AUTOMATIC RINGING DISCONNECT; Fred Schoenwolf, Chicago, Ill. App. filed Nov. 27, 1914. The application of ringing current to the called line is interrupted and a disconnect signal given should the calling subscriber replace his receiver prior to receiving a response from the called substation.

1,273,199. ELECTRIC HAIR-CURLING KIT; Sadie Stuckey, Tulsa, Okla. App. filed July 10, 1917. An electric heater requiring no special support, but which may be set upon any flat horizontal surface and utilized for heating an iron and curling the hair.

1,273,203. METHOD OF ELECTRIC WELDING; Elihu Thomson, Swampscott, Mass. App. filed Nov. 6, 1917. Tool forced by practically continuous or steady pressure against the work by the application of an intermittently acting power, as, for instance, the power of a pneumatic hammer.

1,273,223. PROCESS FOR MAKING METALLIC CERIUM AND THE LIKE; Alcan Hirsch, New York, N. Y. App. filed Sept. 1, 1917. Production of metallic cerium and similar rare-earth metals, such as "misch-metal."

1,273,224. CONNECTOR; Bryson D. Horton, Detroit, Mich. App. filed Aug. 31, 1916. For effectively connecting a member of thin blade-like construction to a supporting member; adapts itself particularly for effecting substantial rigidity in the movable contacts of a switch.

1,273,225. CONNECTOR; Bryson D. Horton, Detroit, Mich. App. filed July 14, 1916. For connecting switch contacts of the knife-blade type so as to operate in unison and be in perfect alignment with respect to the coöperating contacts.

1,273,245. ELECTROMAGNETIC SWITCHING DEVICE; Alben E. Lundell, New York, N. Y. App. filed Sept. 11, 1916. Its main object is the insurance of uniform and reliable contact engagement under varying values of operating current and with a minimum required value of holding current.

1,273,246. CONNECTING DEVICE FOR TRAIN TELEPHONE LINES; Gustav W. Lundin, Bellevue, Iowa. App. filed Oct. 6, 1916. Electrical continuity of the wires carried by the respective cars of the train may be established through the couplings of the air hose of the brake system.

1,273,247. AUTOMATIC SWITCH; Frank A. Lundquist, New York, N. Y. App. filed Dec. 2, 1916. Employed in telephone systems.

1,273,250. SPRING TERMINAL CLIP; William Luxmore, Chicago, Ill. App. filed Jan. 27, 1916. Made of a strip of brass or other metallic ribbon and formed so that two portions of the strip oppose each other in order to grip the conductor.

1,273,258. ELECTRIC LIGHTING SYSTEM; William S. Mason, Mayfield, N. Y. App. filed June 28, 1915. Employs a plurality of electric lamps of substantially the same resistance whose total resistance bears to their individual resistance the same ratio that the voltage of the current from the dynamo bears to the voltage of the current from the battery.

1,273,274. TERMINAL BANK; John N. Reynolds and Oscar F. Forsberg, Yonkers, N. Y. App. filed May 25, 1916. Used in automatic and semi-automatic telephone systems.

1,273,313. INSULATOR; Thomas W. Beatty, Carey, Ohio. App. filed Aug. 9, 1917. Component parts are so held in assembled relation that they are very convenient for handling by the electrician.

1,273,351. TELEPHONE RECEIVER; Halsey A. Frederick, Hackensack, N. J. App. filed July 20, 1916. To produce a receiver of improved efficiency of transmission and increased quality of articulation and one that is more economical in design from a standpoint of cost of production.

1,273,357. ELECTROLYZING APPARATUS; Henri C. L. Gougnard, Paris, France. App. filed Sept. 4, 1913. To facilitate assembling and taking apart the elements or members of the apparatus.

1,273,378. MEANS FOR CONTROLLING ELECTRIC CIRCUITS; William O. Kennington, Detroit, Mich. App. filed April 5, 1916. Has particular utility in electrical apparatus employed on engine-driven motor vehicles, and especially in connection with ignition apparatus for such engines.

1,273,389. ELECTRIC WATER HEATER; Wayne D. Ludwick, near Tacoma, Wash. App. filed Oct. 21, 1914. Has sufficient electrical efficiency to enable it to enter into competition with water heaters in which a gaseous fuel is used as the heating agent.

1,273,390. TICKET-CANCELING MACHINE; Harry Lundgren and Frank Teberg, Oakland, Cal. App. filed Feb. 23, 1917. To be used in post office, ticket offices, banks and other places where the canceling of stamps, tickets, papers and the like is necessary.

1,273,408. LIGHTING FIXTURE; Milton B. Roller, Palo Alto, Cal. App. filed March 19, 1918. Renders easy the assemblage of the parts of a fixture.

1,273,409. CONTACT-RING SYSTEM; Charles Roulland, Paris, France. App. filed July 7, 1917. Very simple, strong and of cheap manufacture owing to the shaping being done almost entirely in the lathe.

1,273,431. METHOD AND APPARATUS FOR RADIO SIGNALING; Roy A. Weagant, Roselle, N. J. App. filed Jan. 6, 1916. Receiving antennas constructed to exclude interfering electromagnetic waves of a frequency considerably higher than the frequency of the incoming waves to which the receiving apparatus is adapted.

1,273,432. COMPOSITION FOR ELECTROLYTES FOR ELECTRICAL ETCHING; Joseph H. Weeks, Rutledge, Pa. App. filed April 4, 1917. Improvement.

1,273,447. DRY SECONDARY CELL; Julius Becker, Chicago, Ill. App. filed March 29, 1917. To provide an arrangement of electrodes and separators or separating material such that the electrolytic will be most fully and perfectly presented to and brought into contact with the surfaces of the electrodes.

1,273,451. ELECTRIC HEATING APPARATUS; Manual Bouzo, Havana, Cuba. App. filed Dec. 13, 1916. Adapted to an electric circuit of 110 volts just as much as to one of 220 volts.

1,273,490. CHARGING REGULATOR FOR STORAGE BATTERIES; Arthur H. Hoffman, Ames, Iowa. App. filed May 1, 1916. Means for regulating the charging of a storage battery from a variable-speed generator.

1,273,493. METHOD OF BONDING RAILS; William E. Huber, East Cleveland, Ohio. App. filed March 26, 1914. Method whereby bonds of the socket-connected type may be restored to usefulness without being replaced.

1,273,499. TELEGRAPHIC APPARATUS; Paul Kaehler, Berlin, Germany. App. filed April 4, 1913. Type-wheel printing telegraphs.

1,273,511. ROTATING FIELD MAGNET; Birger Ljungstrom, Stockholm, and Fredrick Ljungstrom, Brevik, Lidingon, Sweden. App. filed Jan. 19, 1918. Improvement of magnets provided with parallel slots.

1,273,623. PANELBOARD; Hubert F. Krantz, Brooklyn, N. Y. App. filed Jan. 23, 1913. To provide a simple but effective panelboard by which means a plurality of branch circuits can be controlled.

1,273,626. MEANS FOR TRANSFORMING DIRECT CURRENT; Irving Langmuir, Schenectady, N. Y. App. filed Dec. 29, 1913. An energy-storing device arranged in cooperative relation with electron discharge tubes.

1,273,627. METHOD OF AND MEANS OF CONTROLLING ELECTRIC CURRENTS OR POTENTIALS; Irving Langmuir, Schenectady, N. Y. App. filed Feb. 5, 1914. Variations of potential or current of one circuit are utilized to produce desired changes in the potential or current of another circuit suitably coupled with the first.

1,273,628. FILM CONDUCTOR AND THE METHOD OF MAKING THE SAME; Irving Langmuir, Schenectady, N. Y. App. filed June 6, 1914. Comprises gas-free metal films formed in a vacuum too high to permit a disruptive electrical discharge and suitable particularly as electrodes for electrical devices, especially devices requiring a very high vacuum in which gas-free electrodes are necessary.

1,273,629. METHOD OF EXHAUSTING INCANDESCENT LAMPS; Irving Langmuir, Schenectady, N. Y. App. filed Dec. 5, 1914. Improvements.

1,273,630. ELECTRON-DISCHARGE APPARATUS; Irving Langmuir, Schenectady, N. Y. App. filed Oct. 16, 1913. Comprises structural features of novelty which coöperate to improve the operating characteristics of devices of this type as well as to simplify their manufacture.

1,273,647. BRUSH HOLDER; Albert B. Moore, Roselle, N. J. App. filed July 24, 1915. For supporting the brushes of small electric machines such as motors and generators.

1,273,659. DOUBLE-CURRENT OVERLOAD RELAY; Robert J. Parsons, Schenectady, N. Y. App. filed Aug. 9, 1915. For operation on a circuit in which the potential of the current differs from time to time.

1,273,661. INTERLOCKING CONTROL FOR MINE HOISTS; Charles L. Perry, Schenectady, N. Y. App. filed March 25, 1918. Hoist may be started, stopped and generally controlled in a reliable, simple and efficient manner.

1,273,666. ELECTRICAL HEATER; Charles C. Powers, William, Ariz. App. filed Jan. 25, 1918. To provide a convenient and inexpensive way for applying electrically generated heat to air-circulating pipes.

1,273,714. ELECTRIC SWITCH; Carl E. Anderson, Bridgeport, Conn. App. filed March 28, 1918. To provide means for holding the push-buttons in proper position for their most efficient operation and to impart a better appearance to the switch as a whole.

1,273,719. CONTROL OF ELECTRIC CIRCUITS; Benjamin H. Arnold, Erie, Pa. App. filed Nov. 7, 1917. Improved means whereby the opening of power circuits is effected under safe conditions and the possibility of making improper circuit connections reduced to a minimum.

1,273,744. MEANS FOR PROTECTING ELECTRIC SYSTEMS; Elmer E. F. Creighton, Schenectady, N. Y. App. filed May 13, 1912. Particularly adapted to the conditions of multiple feeders that exist on nearly all large transmission systems.

1,273,749. PUSH BUTTON; Thomas M. Demerest, Dumont, N. J. App. filed June 2, 1916. A device of this character which shall be extremely simple.

1,273,754. RHEOSTAT; Ferdinand Eberger, Boardman, Ore. App. filed Sept. 6, 1917. For use in connection with incandescent electric lamps, whereby the luminosity of such lamps may be varied.

1,273,758. LEADING-IN CONDUCTOR; Colin G. Fink and Walter E. Koerner, East Orange, N. J. App. filed Sept. 25, 1915. For evacuated vessels, such as incandescent lamps, its object being to provide a leading-in conductor which is cheap and has great electrical conductivity.

1,273,773. POLE-CHANGING APPARATUS; Louis M. Evans, Alexandria, Va. App. filed April 11, 1917. Current-reversing transmitter or relay for use in connection with telegraph, cable, radio or other systems.

1,273,782. ELECTRIC SHIP PROPULSION; Henry M. Hobart, Schenectady, N. Y. App. filed Nov. 20, 1914. Alternating-current electric generators and squirrel-cage induction motors for starting a ship's propeller and carrying it up to the running speed with ample torque throughout the entire range of speed.

1,273,783. ELECTRON-DISCHARGE APPARATUS; Irving Langmuir, Schenectady, N. Y. App. filed Oct. 16, 1913. Provided with an electron-emitting cathode, an anode and a conducting body, commonly termed a "grid," for statically controlling the electrical discharge conditions of the tube.